WASHINGTON METROPOLITAN AREA WATER PROBLEMS

HEARINGS

BEFORE THE

JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS CONGRESS OF THE UNITED STATES

EIGHTY-FIFTH CONGRESS

SECOND SESSION

ON

WATER SUPPLY AND POLLUTION PROBLEMS IN MARYLAND, VIRGINIA, AND THE WASHINGTON METROPOLITAN AREA

APRIL 22, 23, AND 25, 1958

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WASHINGTON METROPOLITAN AREA WATER PROBLEMS

TUESDAY, APRIL 22, 1958

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS,
Washington, D. C.

The joint committee met, pursuant to call, at 9:40 a. m., in room P-38, United States Capitol Building, Washington, Senator Alan Bible (chairman) presiding.

Present: Senators Bible (presiding), Beall, and Representative Hyde (vice chairman).

Also present: Frederick Gutheim, staff director; Betty Kraus, secretary; and Gilbert V. Levin, special consultant.

Senator BIBLE. The meeting will come to order.

This is the first of a series of hearings which the Joint Committee on Washington Metropolitan Problems will conduct, pursuant to its authorization in House Concurrent Resolution 172, to study problems created by the growth and expansion of the metropolitan area; how they are being resolved by the existing instrumentalities of government; and their impact on the District of Columbia.

This hearing is pursuant to this House Concurrent Resolution 172, and Mr. Reporter, I ask that this resolution be inserted in the record as exhibit A.

(The document marked "Committee Exhibit A" is as follows:)

EXHIBIT A

[H. Con. Res. 172, 85th Cong., 1st sess.]

CONCURRENT RESOLUTION

Resolved by the House of Representatives (the Senate concurring), That there is hereby established a joint congressional committee to be composed of three members of the Committee on the District of Columbia of the Senate, to be appointed by the chairman of such committee, and three members of the Committee of the District of Columbia of the House of Representatives, to be appointed by the Speaker of the House of Representatives. The joint committee shall select a chairman and a vice chairman from among its members. A majority of the joint committee shall constitute a quorum except that a lesser number, to be fixed by the joint committee, shall constitute a quorum for the purpose of administering oaths and taking sworn testimony.

SEC. 2. The joint committee, or any duly authorized subcommittee thereof, shall examine, investigate, and make a complete study of any and all matters pertaining to (a) the problems created by the growth and expansion of the District of Columbia and its metropolitan area, (b) how and with what degree of success such problems are handled and resolved by the various agencies and instrumentalities of the Government which are charged with the duty of resolving such problems, and (c) how the resolution of such problems is affecting the affairs of the District of Columbia. The joint committee shall report its findings, together with its recommendations for such legislation as it deems ad-

visable, to the Senate and the House of Representatives at the earliest practicable date, but not later than January 31, 1959. Upon the submission of such report, the joint committee shall cease to exist and all authority conferred by this resolution shall terminate; but the joint committee shall make a progress report on its activities by January 31, 1958.

SEC. 3. The joint committee, or any duly authorized subcommittee thereof, is authorized to sit and act at such places and times within the United States, to hold such hearings, to require by subpena or otherwise the attendance of such witnesses and the production of such books, papers, and documents, to administer such oats, to take such testimony as it deems advisable.

SEC. 4. The joint committee shall have power to employ and fix the compensation of such experts, consultants, and other employees as it deems necessary in the performance of its duties.

SEC. 5. The expenses of the joint committee, through January 31, 1958, which shall not exceed $50,000, shall be paid from the contingent fund of the Senate upon vouchers approved by the chairman of the joint committee.

Senator BIBLE. The present hearings will deal with problems related to the Potomac River. These embrace watershed management, stream pollution, and water supply. Subsequent hearings, which the committee expects to hold before Congress adjourns, will deal with metropolitan transportation and economic development.

At this point in the record I am inserting the announcement of the hearing and the invitation to participate which the committee has addressed to those known to be interested in this proceeding. At this point in the record I am inserting as exhibit B the notice to prospective witnesses.

(The document referred to as committee exhibit B is as follows:)

EXHIBIT B

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS,
Washington, D. C., April 9, 1958.

Notice to Prospective Witnesses:

Permit me to call to your attention and invite your participation in a series of public hearings on Potomac River water problems of importance to the Washington metropolitan region, to be conducted by this Joint Committee on Washington Metropolitan Problems, commencing at 9:30 a. m. Tuesday morning, April 22, in the Senate District Committee Room, United States Capitol. Public announcement of these hearings was made April 2.

The joint committee has prepared a series of three consultants' reports (herewith enclosed) which will serve as background for these hearings. An earlier progress report is also available. Since the committee is not at this time considering legislative proposals, the purpose of the hearings should be regarded as an opportunity to present factual material that will supplement that contained in the consultants' reports, and to permit an expression of views, especially on problems and possible legislative actions cited in the reports.

Your intention to participate should be communicated at the earliest time to the staff director of this committee in order that we may schedule, to the extent practicable, the appearance of participants. Should you desire to be heard, please furnish the staff director 20 copies of your prepared statement in advance of the meeting and on the day of the meeting, have available another 20 copies of your statement for the press.

Our phone number, in case you have any questions, is Republic 7-7500, extension 8804 or 8809.

ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems.

Senator BIBLE. Others, of course, will appear.

In particular, I might read the sentence from this invitation which states:

Since the committee is not at this time considerting legislative proposals, the purpose of the hearings should be regarded as an opportunity to present factual material that will supplement that contained in the consultants' reports, and to

permit an expression of views, especially on problems and possible legislative actions cited in the reports.

The reports referred to are: Metropolitan Water Problems, by Bernard Frank; Sewage Disposal and Water Pollution, by Gilbert V. Levin; Water Supply, by Gilbert V. Levin.

Copies of these reports have been widely distributed. The main objective is to clarify an exceedingly complex subject, rather than to solve the problems they discuss or add much fresh information to that developed in earlier studies. We should be trying to understand these problems with a view to reaching a rather widespread agreement on what to do about them.

The main focus of interest of the committee might be described as institutional and organizational. We do not aim to solve technical problems in a technical way, but to make sure that the conditions for solution are met in terms of policy, powers, organization, jurisdiction, money, and in other ways. I might add that these, too, and especially the latter, are questions quite as complicated as any which the engineer, the conservationist, the public health expert, or other technicians must deal with. They invite the attention of State and local officials as well as the Congress of the United States. Our metropolitan problems are continuing problems; not to be solved by any single action. Hence, we are interested in establishing the needed framework of metropolitan agencies, equipped with suitable powers, and able to command the funds needed to meet the needs of our rapidly expanding greater Washington.

In our consultants' reports a number of suggestions and recommendations for such governmental machinery have been made. In Mr. Frank's report on watershed management, for example, he has concluded that the entire Potomac River Basin needs to be considered as a whole, and he proposes a Federal Board of Review and Coordination to do just that. Mr. Levin's reports on water supply and sewage treatment strongly emphasize the desirability of consolidating to a considerable degree, metropolitan water systems and sewage-treatment plants in the metropolitan area. Our committee would find it helpful if, in the course of your comments, you will give attention to such points as these.

I might also say, at the very beginning of these proceedings, that the committee is fully aware of the fiscal difficulties its studies and proposals will encounter. We believe we are obligated to back up any recommendation which we finally make with workable plans to finance them. Fortunately, water and sewer services, such as we are considering here this morning, are commonly paid for by metered rates or service charges rather than from general tax funds. It is probable that large capital outlays will be required to meet the need, but there can be little doubt that these outlays will be recovered at very little risk over a reasonable number of years. The overall fiscal picture is thus one of substantial gains in service and greater economies per unit once a regional system gets into operation.

This committee recognizes, too, that if the Potomac is to be developed to a higher standard than other rivers in Maryland and in Virginia, it will have to be with some unusual measures by the Federal Government in recognition of its unique interest in this area.

In conclusion, let me say again that in these hearings we are interested in amplifying the studies which our consultants have made. We do not expect to come to any definite conclusions until the end of the year. Our committee's final report is due in January of 1959.

Further hearings will be held on more definite proposals the committee intends to include in this final report. I may also point out that the committee and its staff are in close and continuous touch with many of you people, and we regard these hearings as enlarging rather than changing in any sense these relationships.

These hearings have been organized to allow us to hear first, those who will represent and will speak to the national interest in this metropolitan region and river basin, or the broad regional interest.

Our first witness will be Edward A. Ackerman, a distinguished geographer and water-resources expert, former director of river program analysis for the President's Water Resouces Policy Commission, and now head of the water resources division of Resources for the Future, a private foundation in the field of conservation.

This afternoon we shall hear State and county officials. Tomorrow we shall meet in this room at 9:30 again to hear representatives of national and local organizations. May I remind you that this schedule is subject to the time needed by various witnesses to present their material, and may be interrupted to allow Members of Congress the courtesy of being heard.

Now, before calling upon our first witness this morning, I will be happy, Senator Beall, to hear any comments you have to make.

Senator BEALL. I have none, Mr. Chairman.

Senator BIBLE. Mr. Hyde.

Representative HYDE. Not at this time, Mr. Chairman, thank you.

Senator BIBLE. Mr. Ackerman, we are happy to have you with us this morning. I think if you sit at the end of the table we can hear you, if you will speak loudly.

You may proceed.

STATEMENT OF EDWARD A. ACKERMAN, HEAD OF THE WATER RESOURCES DIVISION OF RESOURCES FOR THE FUTURE

Mr. ACKERMAN. Mr. Chairman, members of the committee, this is the first occasion which I have had the honor to act as a witness before a committee of Congress. I am pleased that it should concern the Washington metropolitan area for which the leadership of Congress is essential.

I have been a resident of the area at intervals for a total of 17 years, since 1941.

During that time, as several members of this committee have, I have seen Washington grow from an administrative center of modest size into a major metropolitan area.

During that time, I also have seen the Federal leadership in the United States water development assume commanding proportions both technically and financially. Because of my two interests, one in the metropolitan area, and the other in water development, I cannot escape noting a local contrast. Here at the doorstep of this vital, rapidly growing national center is one of the most undeveloped river basins of the entire country. There is cause for some concern about

the situation now. Viewing the future, there probably is even more cause for concern.

Your staff director, Mr. Gutheim, has told me that the committee commendably is considering the future of the metropolitan area over a long range, say 40 to 50 years. Since the view of the committee is a farsighted one, I shall place my especial comments this morning within that framework.

In my brief statement, I should like to offer four suggestions for your consideration. First, that the capacity of the metropolitan area for growth is great.

Secondly, the District of Columbia is obsolescent as a functioning unit.

Third, the need for the development of amenities in this area is extraordinary.

And last, that leadership toward orderly growth of the Capital region can begin on the Potomac River Basin.

I believe that we who live in the Washington metropolitan area and those who have an opportunity for leadership in its affairs should think of this as a great city in the future. All of the past published estimates of this area's growth, when they have come to the date of proof, have erred on the conservative side.

It is highly likely, in my view, that present estimates of Government still will fall short of actually what will happen. I can see little harm, and much potential benefit, from setting our sights high.

Within the period which you are thinking about, I believe that you might consider a city at least three times its present size as possible, if not likely.

I say this for three reasons. First, the United States population is going to continue growing, and as it grows, so must the Capital.

Secondly, compared to the older capitals of the world, the ratio of Washington's size to the total population of this country is small. This suggests that Washington may not yet have matured completely as a Capital City.

For instance, France has only nine times the population of its capital, Paris. The population of Great Britain is only six times that of London. The present population of the United States is about 85 times that of the Washington area.

Third, Washington is almost certain to become a more important manufacturing center in some respects than it is, and it is likely to develop as more of a commercial center.

Its present size alone is likely to stimulate further manufacturing in this metropolitan area; and astride the only important land transportation routes between the industrial northeast and the now fast-developing southeast, it is a natural transportation terminus.

Thus we can look forward, I think, with confidence and pride, to the future growth of this city. But we also might consider that haphazard, unplanned growth, which unfortunately has characterized some of the past, can bring all of the problems which are evident in the larger cities of today.

One is excessive energy of the residents spent in commuting. Another is city centers with grave financial problems. Another is instability of property values, lack of outdoor amenities, and drab, hard lives for a lot of people.

We should be concerned about this—we should be concerned because the obsolescence of governmental and administrative structure of the metropolitan area leaves us in danger of haphazard planning.

We should be concerned further because the need for amenities in this city is beyond that of any other large center in the country.

I said that the District of Columbia was obsolescent. One has only, I think, to see the dominance of Maryland and Virginia automobile license plates within the District on any working day of the week to find some tangible support for this statement.

Actually, this is only another way of describing something that is happening all over the country. Where there are cities of any size—city, suburbs, and rural areas are becoming less and less sharply distinguishable from one another. In our economy, city, suburb, and region are becoming more and more closely tied into one functioning unit.

The new national-defense limited-access highway system, the program which Congress has just accelerated, will hasten the process of spreading city functions over a wide geographical area.

DISPERSAL

For this and other reasons, the basic activities upon which Washington depends already are being dispersed into the region. I call your attention to the location, or the planned location of the central offices of the Atomic Energy Commission, Bureau of Standards, Central Intelligence Agency, Bureau of the Census, and several Defense Department centers by way of illustration.

New manufacturing and commercial activities also are showing a dispersed pattern.

Thus, we may think not only of a great city, but also of a city less and less distinguished from the region in which it lies.

In the face of the many governmental jurisdictions which are involved, it would seem that leadership for action in the metropolitan region must come from Congress, if the whole region is to be considered. But, is there any need for planning for the whole region?

I think this is a question which deserves at least passing mention. If for no other reason it should be to provide for the amenities. Perhaps I should explain what I mean by amenities. I mean beauty and dignity in the architecture, public architecture to which Congress foresightedly has paid attention. But I also mean adequate, reasonably comfortable mass transportation, minimum traffic congestion, adequate open places located within the metropolitan area, opportunity for outdoor recreation, convenient access to historical sites, and clean streams.

I say that the need for these things is extraordinary in the Capital area, because the Capital itself is considered an amenity, perhaps even more than a service area by many of the citizens of the Nation. It as once offers inspiration and is a symbol to the millions who visit it each year. It should be a symbol of orderliness.

Furthermore, this city is a window upon the United States for many from the rest of the world. Many important people who come to this country see the United States in Washington.

Last, of course, we might mention the needs of the residents of the metropolitan area, like the residents of any other city, their health and social outlook depend in part on the public provision of these amenities.

What sort of symbol would Congress like to have in this area for the citizens of the Nation and what sort of window on the United States for the representatives of other countries?

Well, these, of course, are rhetorical questions. Few, if any, national leaders would welcome confused and contradictory developments, the friction and inefficiency of grating traffic, a silt- and sewage-laden stream, perhaps flooding, and the social problems in the city.

The real question is in the manner in which these problems ought to be met. Are they to be handled in the future principally as they become crises? Or will they take account of the likely growth of the metropolitan area and seek to avoid them at far less cost?

I believe that an opportunity lies before this committee and the Congress. Good planning and farsighted public action certainly will require much further study and perhaps long, continued study. At the same time, the lines of opportunity and some desirable actions may be seen clearly.

A REGIONAL CITY

The opportunity lies in thinking and planning for the Capital City and the Capital region as one. So far as I know, no other country in the world has thought of its capital in these terms. The city is already large and some opportunities have already slipped by. Nonetheless, there still is an unparalleled opportunity to guide the growth of the Capital region with duty, dignity, and depth.

The problem of Capital growth and development should be thought of as a regional one. Even as further studies of this complex situation are encouraged or supported, there are several patterns of action in which leadership can be most helpful to the future of the region. It cannot go wrong on encouraging or supporting the further development of the Potomac Basin and its watershed.

POTOMAC RIVER DEVELOPMENT

The metropolitan area will need clean water and lots of it. It needs not only water for municipal services and supplies, but clean water for recreation. Perhaps it even has the right to a clean Potomac estuary. The watershed treatment which will help to clean out the Potomac can add to the health and intensity of the region's agriculture. A growing metropolitan area should have a close interest in that. Rising land values will make flood control more important. It probably can use all of the hydroelectric power which is likely to be developed economically in the region. For these reasons, Congress cannot go wrong on planning watershed treatment and better regulations of the flow of the river.

There are other actions which might be considered. Congress cannot go wrong in planning the early reservation of adequate, equitably distributed open spaces throughout the metropolitan region. It cannot go wrong on encouraging the planning of a transportation system to serve a large city. It cannot go wrong in a regional program of resource conservation which helps to train the growth of the

city in the responsibilities of citizenship. It cannot go wrong on a program of highway development which conscientiously ties the metropolitan area, historical sites, and scenic resources into a pattern of easy accessibility, and there may be others.

Some of these actions will require the expenditure of money. But even should appropriations for these purposes be relatively small, at times, some important things can be accomplished if leadership provides the correct guides.

There are many voluntary organizations of national scope whose interest and assistance could be profitably enlisted, if clearly stated objectives were agreed upon and published.

Leadership with vision is the important thing.

In closing, may I relay a story that I once heard about Morris Cafritz, the Washington realtor and builder. A friend of his is reported once to have asked Mr. Cafritz what the secret of his success has been. (I am sure that you know that Mr. Cafritz started his business here in Washington some years ago when Washington was a different and much smaller city.) Mr. Cafritz is reported to have replied, in a few words, summarizing what I still feel about Washington, and I quote, "To me—Washington is the Capital of the greatest country in the world, a great and growing Nation. I knew that I couldn't go wrong by investing in its future."

I think these words are well worth remembering for public investment, no less than for private investment.

I thank you.

Senator BIBLE. Thank you, Mr. Ackerman. Do you have any questions, Senator Beall?

Senator BEALL. No, Mr. Chairman.

Senator BIBLE. Mr. Hyde?

Representative HYDE. Mr. Ackerman, I take it from what you have said in general terms about broad objectives, that what you mean must be regional treatment, that is the approach of this water problem on a regional basis, rather than on a politically segregated basis.

Mr. ACKERMAN. Yes; I think if there is anything that we have learned from technology and from the experience of the last 20 years in this country about water development, it is that it is always in the end essential to consider the development of water resources on the basis of a basin and watershed. It cannot be treated effectively piecemeal.

Representative HYDE. Well, then, specifically, would you recommend a regional administrative organization for dealing with regulations, control, and planning for water resources, and including pollution?

Mr. ACKERMAN. Representative Hyde, I think this is certainly one thing that should be considered. However, I feel it would be inappropriate for me as a foundation employee to recommend any particular form of administrative unit for water resources.

Representative HYDE. Well, the thing that bothers me is, when you speak of regional approach, just what do you mean?

Mr. ACKERMAN. Well, I think there may be several different forms of regional agencies that are possible.

Representative HYDE. Well, several different forms of a regional agency, but a regional agency.

Mr. ACKERMAN. I think certainly this should be seriously considered.

Senator BIBLE. Mr. Gutheim?

FUTURE TECHNOLOGICAL CHANGE

Mr. GUTHEIM. I think consistent with Mr. Ackerman's position as a member of the staff of Resources for the Future, his unwillingness to comment on pending legislative questions is justified. I am also considering the broad view of the future of some 40 years or more that he has given. I would like to ask whether during this period it seems likely that changes of a technological nature would be likely to occur that would change in any sense the recommendations and suggestions that he has given in his prepared statement. The application of nuclear agency, for example, to water problems.

Mr. ACKERMAN. Would you like me to speak to that, Mr. Gutheim?

Mr. GUTHEIM. If you are able to do so briefly, yes. I realize I am opening up an enormous field of conjecture.

Mr. ACKERMAN. This, of course, almost demands more foresight than any one person or group of persons, for that matter, can provide. I think we might speak a bit, or I might speak a bit, on that.

From the experience of the past 30 or 40 years, some very interesting technical developments have occurred in the water field. In general, there are three types. There is the technology which has brought possibilities of large-scale storage on a variety of different kinds of sites; long-distance transportation of water; and then there has been a technology which has reduced the demands of water in industry. Finally, we have also brought in new sources of water. For instance, deep underground sources, or water from weather modification.

However, there are certain basic conditions about the occurrence of water naturally, which I think can lead to planning with a degree of certainty no matter what happens technically. The natural supply fluctuates a good deal. Another point is that no user prefers a contaminated water or a silt-laden water. Hence, I would say any program of flow regulation or cleaning up the streams is not likely to be obsolete or affected by technology in the future, so long as it is planned on a relatively large-scale basis.

Also, I believe that because of the increasing population, a plan which goes on the basis of multiple uses, is not likely to be obsolete or obsolescent, either, for a heavily populated area.

On the other hand, planning should be approached in as flexible a manner as possible. This is another of the things that we have learned, and perhaps that is one reason for an agency that has continuity in considering regional problems. That is all.

Senator BEALL. In 1946, I believe, the Army engineers under the direction of Congress made a report of a survey of the entire Potomac River Basin.

Have you had an opportunity to see that survey?

Mr. ACKERMAN. Well, I saw the review of that which was made by the Federal Power Commission, I think, with some revisions on it at the time I was with the President's Water Resources Policy Commission in 1950–51.

Senator BEALL. That is quite a program. The Army engineers did a splendid job on it at that time. That, of course, is in the files.

Mr. ACKERMAN. Yes, sir.

Senator BEALL. Now, I think it would be well if the engineers bring that up, when they think about the future.

Mr. ACKERMAN. Well, this certainly was a carefully studied plan by competent engineers, and I think the committee, among other things, will have to consider this. I understand the Corps of Engineers is——

Senator BEALL. Making another survey under authorization provided by former Senator Neely and myself. Now, that is being brought up to date.

Mr. ACKERMAN. Well, in turn it will be presented to the Board of Engineers for Rivers and Harbors, and I suppose to the Congress.

Senator BEALL. Yes.

Senator BIBLE. Congressman Hyde?

Representative HYDE. Mr. Chairman, Mr. Ackerman, you mentioned the necessity for Federal leadership in water development. Certainly, that is true as far as the Nation as a whole is concerned.

Mr. ACKERMAN. Yes, sir.

Representative HYDE. I hope to see the Federal Government take a much firmer hand in such leadership in the near future. But, getting down to this specific problem that we have in this area, of course, that is one of the purposes in the establishment of this committee, an attempt to get some Federal leadership.

Now, do you have any specific suggestions as to what form that leadership should take, or what specific thing should be done on the Federal level in the exercise of such leadership? Do you have anything specific to say about that?

Mr. ACKERMAN. Well, the one thing on which I can be definite, and not evasive, as you suggested I was, perhaps, on the earlier question, is that a program of planning and study which goes into this problem in depth, on a regional basis, is essential. And I would hesitate, on the basis of my present limited knowledge of the possibilities in the region and even the problems, to suggest just what form that agency should take.

On the other hand, the Federal interest is because of landholding, the Federal interest in the Capital, for the reasons I suggested in my opening statement, would point in the direction of leadership—that is, Congress, or the Federal Government, taking a stand which will guide.

I am highly in favor of as much State participation as can be brought into it. So you may have, in a way, an interagency effort that might come out of this.

Representative HYDE. But you think much more use could be made of the present Interstate Commission that we had?

Mr. ACKERMAN. Again, I think this is one of the possibilities, and I have been one who appreciated the efforts, and I feel that the Interstate Commission on the Potomac River Basin, with the authority it has, and the funds which it has had, has done a very good job. But, of course, its authority has been very limited.

Representative HYDE. I take it from that, then, that you feel, to be more effective, it should have more authority and more funds?

Mr. ACKERMAN. I think probably those would be both good things, if that is the agency which you are to choose to carry out the planning and wishes of the Congress and the region.

Representative HYDE. Thank you, Mr. Chairman.

Senator BIBLE. Mr. Gutheim?

Mr. GUTHEIM. No, sir.

Senator BIBLE. Mr. Levin?

Mr. LEVIN. No questions.

Senator BIBLE. Thank you very much, Mr. Ackerman.

The next witness will be Colonel Welling.

STATEMENT OF COL. A. C. WELLING, CHAIRMAN, WATER SUPPLY AND POLLUTION ABATEMENT COMMITTEE, WASHINGTON METROPOLITAN REGIONAL CONFERENCE

Colonel WELLING. Mr. Chairman and committee members, I am here this morning wearing but one of my hats, and this particular hat is one of the chairman of the water-supply and pollution-abatement committee of the Washington Metropolitan Regional Conference.

Our committee was pleased to note some time ago the importance with which your joint committee regarded its study of the Potomac River.

Senator BIBLE. May I ask you, Colonel, will you develop in your prepared presentation, will you say what this committee is, for the information of the chairman—who its members are and how it is created?

Colonel WELLING. The membership of the regional conference?

Senator BIBLE. What is the official title?

Colonel WELLING. Washington Metropolitan Regional Conference, better known to Congressman Hyde than it is to myself, and I didn't propose voluntarily to burden the record with a layout of our charter. But it is composed of members of the governing bodies—and this is important—the governing bodies of Fairfax County, Arlington County, Falls Church, Alexandria, Prince Georges County, Montgomery County, and the State senator from Virginia; the member of the House of Delegates of Virginia, serving on a tristate transportation committee; the State senator from Maryland, and the member of the House of Delegates from Maryland, serving on the tristate transportation commission, and a member representing the District of Columbia Committee of the United States Senate, who was——

Representative HYDE. The Senator from Pennsylvania, Senator Clark.

Colonel WELLING. A member representing the District of Columbia Committee of the House of Representatives, Congressman Hyde, and the Commissioners of the District of Columbia.

Senator BIBLE. I understand you are chairman of that conference.

Colonel WELLING. I am chairman of the water-supply and pollution-abatement committee of that conference.

Senator BIBLE. I see. And that committee is a membership committee of the conference?

Colonel WELLING. Yes, sir.

Senator BIBLE. I understand; thank you, Colonel. I thought we'd better clear the record on that point. You may proceed.

Colonel WELLING. And in a regional way perhaps a most active committee of that conference.

Now, we want to compliment you and your staff on the general excellence of the three basic reports which have been prepared for your use and which serve as a point of departure for today's hearings.

The three reports have been available to our committee for such a short period of time that we decided, at the meeting which we held last week, to submit only general comments this morning. We have prepared answers to all questions set forth in both of Mr. Levin's reports, but we are withholding those answers for further contemplation.

Your staff director has given assurance that your joint committee will be responsive to such specific suggestions and opinions as our committee may wish to make at a later date.

Representative HYDE. The questions that you referred to; are those questions appearing at the end of each one of those reports on page 25 in one report, and 24 in another report?

Colonel WELLING. Yes. Appears at the end of Mr. Levin's reports.

Representative HYDE. Thank you.

Senator BIBLE. Those will be forthcoming at what date, Colonel Welling?

Colonel WELLING. Oh, next month, sir.

Senator BIBLE. 30 days?

Colonel WELLING. Yes, sir.

Senator BIBLE. Thank you.

GOVERNMENT OF THE DISTRICT OF COLUMBIA,
EXECUTIVE OFFICE,
Washington, D. C., May 16, 1958.

Hon. ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems, Senate Office Building, Washington, D. C.

DEAR SENATOR BIBLE: During the hearing conducted by you on April 22, 1958, you requested that I provide answers to the questions appearing in the staff reports covering water supply, sewage disposal and water pollution and conservation and recreation.

I am transmitting herewith responses to those questions developed by the water supply and pollution abatement committee of the Washington Metropolitan Regional Conference of which I am chairman. In addition to having been developed and reviewed by the said committee, these proposed responses have also been submitted to each member of the steering committee of the regional conference. No changes or objections having been received from the steering committee members, it is believed that these may also be considered as having also been unanimously accepted by that group.

If there is any other way in which either my committee or I can be of assistance to your joint committee in its study of metropolitan problems, please call upon us.

Sincerely yours,

A. C. WELLING,
Colonel, Corps of Engineers, United States Army,
Engineer Commissioner.

SUGGESTED RESPONSES OF DISTRICT OF COLUMBIA GOVERNMENT TO CONCLUDING QUESTIONS CONTAINED IN STAFF REPORT ON WATER SUPPLY

1. How shall an adequate source of water supply be provided for the present and future needs of the area? This question primarily resolves itself to "What type of storage facilities should be provided on the Potomac River?"

The only major metropolitan water source is obviously the Potomac.

Decisions as to flow regulations can be made only after an adequate survey. Such survey which is now being made by the Corps of Engineers must review all aspects of basin development taking into account the benefits of sound conservation practices and land uses. Future development must provide as far as possible for all reasonable needs of the basin population, including those of Metropolitan Washington.

2. Should the water-supply systems in the Washington metropolitan area be consolidated either administratively or physically, or both?

The present District of Columbia water system should be used to its maximum potential. This would make the cheapest possible supply for the most people. Expanded territory in northern Virginia and in southern Maryland could thus be most cheaply served.

A future major filtration plant above Great Falls probably should be developed for upper Montgomery, lower Frederick, upper Fairfax, and Loudoun Counties.

Administrative consolidation of water distribution systems is unnecessary and undesirable. Water distribution is a local function and should remain so. Metropolitan distribution is unwieldly and costly. The consolidation of distribution networks in northern Virginia could be accomplished without either single administration or financing.

3. What steps can be taken to assure that future decisions affecting water supply be made in a spirit of cooperative area planning rather than community competition?

Future decisions affecting major supply questions can be made only after completion of the Potomac Basin survey by the Corps of Engineers. The District of Columbia and Washington Suburban Sanitary Commission are now able to plan in cooperation. The Arlington water system can also plan adequately. Only competitive problem in planning is in remainder of northern Virginia. Planning authorities in that area may be able to help, and Washington Metropolitan Regional Conference should be placed in position to undertake such planning.

4. How can the Potomac River upstream from Washington be protected against future pollution from residential, commercial, and industrial development?

The best protection of water quality can be had from regional acceptance of a master pollution control and land-use plan and observance of such plan by communities, with enforcement as necessary by State control agencies. Residential, commercial, and industrial pollution should also be controlled by local zoning ordinances prepared in accordance with any accepted regional land-use plan.

5. For what period into the future should plans and construction be undertaken?

A basic river development plan for water-supply purposes should be predicated on year 2100 needs so all needed structures can be known in advance. Flow regulation works should be designed and constructed for needs at least 25 years distant.

Major purification plans should be designed for the year 2000, or later, demands with stage construction for shorter term needs, however, not less than 10 years ahead of expected requirements.

Major distribution lines should be designed for 1980 to 2000 requirements whenever possible.

6. What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

For flow-control works on river, if multipurpose, costs should be allocated to functions. The water supply function could be accepted pro rata by all systems taking water from river. These in turn can recover costs through their rate structures so consumers will ultimately pay these costs. Engineering and development costs of projects would be similarly paid for. Agreements by water systems and localities to accept these costs will be required in advance of construction.

Major plant costs should be recovered through rates with borrowing as necessary.

In both classes of work the Federal interest must be taken into account and Federal obligations reflected in costs allocated to the local jurisdictions.

Colonel WELLING. In that connection, your staff has been welcome to our committee meetings and has been furnished copies of our charter and all of our basic papers, so that I shall not burden the record with further copies here today. Your staff director, Mr. Gutheim, has been helpful in the extreme, both to our group, and to me, personally.

Our committee has been instrumental in bringing about a state of rather happy harmony in water-supply and pollution-abatement matters, as between Maryland, Virginia, and the District. We have invited Loudoun County and Frederick County representatives to our meetings, even though those counties are not members of the regional conference. We desire to keep our committee's work in tune with that of the Interstate Commission on the Potomac River Basin, the Maryland State Water Pollution Control Board, the Commonwealth of Virginia State Water Control Board, and the Washington district of the Corps of Engineers. I may well add, Mr. Chairman, that, from the base of my long-established home in Arlington, and my previous lengthy service in Baltimore, I am able to assist my Virginia and Maryland committeemen in keeping the District Commissioners, particularly the Engineer Commissioner, from dominating the local water-supply and pollution-abatement business.

In regard to metropolitan area water supply, our committee agrees that the greatest need at this time is for an assurance of enough water to satisfy the requirements of expected growth. The really active work in this field now in progress is the Potomac River review report being conducted by the Corps of Engineers at congressional direction.

Senator Beall brought up that item just a moment ago. This study must be acccelerated in all ways possible, and perhaps your joint committee would assist in seeking an increase in the appropriation now pending for this review report in the 1959 appropriations bill.

Senator BIBLE. How much of an increase? That sounds like a familiar statement, Colonel. How much of the increased appropriation?

Colonel WELLING. The amount in the appropriations bill now being considered is $230,000. We would like to see that increased to $500,000 for fiscal year 1959.

Senator BIBLE. We are very accustomed to have you talk about money, Colonel Welling; with complete justification, but I can't see how these problems can be solved with only one thing—money.

Senator BEALL. You mean this additional money is to complete this survey now in progress by the district engineers?

Colonel WELLING. Not to complete it, Senator Beall, but to accelerate it. The engineer district has been getting money in driblets and we wanted to send them—to have a rather sizeable allotment of money out of this session of Congress.

Senator BEALL. Well, it really goes to the office of the district engineer, rather than to the District of Columbia.

Colonel WELLING. Oh, yes, sir, to the Corps of Engineers.

Senator BIBLE. May I ask one question at that point, Colonel? You say that you need $500,000 for the current fiscal year, fiscal 1959, to accelerate the program? Now the programs are projected for how many years? Into fiscal 1960? When will this work be completed?

Colonel WELLING. The work, Senator Bible, would be completed

if we could get a similar approprittion or a like appropriation in the following fiscal year—perhaps in 1962—1961.

Senator BIBLE. When the work is completed in 1961, what will we have before us?

Colonel WELLING. You will have this—and that was the next item in my presentation—you are going to have a comprehensive report on the Potomac River Basin, and some question has arisen in local circles as to the degree that the engineer report will be truly comprehensive.

You Members of Congress hardly need to be assured that the report will be as comprehensive as Congress directs and permits, appropriationwise. Our committee has examined the outline of the engineer report and are satisfied as to the coverage to be provided, not only in the field of navigation, flood control, hydroelectric power, water supply, pollution abatement measures, but recreation, fish and wildlife, conservation, and sizable allotments from the Corps of Engineers resources are made available to other engineers so that they may prepare reports on such items as recreation, fish and wildlife, conservation——

Senator BIBLE. May I ask a question? Is this a study on the complete metropolitan area?

Colonel WELLING. No, it is a study of the entire Potomac River Basin. A review report of the 1946 report to which Senator Beall made reference earlier, but it is a comprehensive report of the entire basin.

Representative HYDE. Senator, just to clarify for the record, including of course the problems of the metropolitan area——

Colonel WELLING. Well, insofar as the metropolitan area has navigational problems, flood control problems, pollution problems, water supply problems, recreation problems, fish problems, wildlife problems, and so on down the line.

Representative HYDE. Well, that is fairly comprehensive.

Senator BIBLE. In this particular metropolitan area, as considered here this morning, can we move forward prior to the time this report is completed in 1961?

Colonel WELLING. Your committee?

Senator BIBLE. Congressional metropolitan committee.

Colonel WELLING. You won't be making the detailed studies of the entire basin that the Corps of Engineers is. You are not going to have available to you one million plus dollars, which is what they are utilizing in conjunction with other Federal agencies, if I answer your question?

Senator BIBLE. I think you answered my question only partly, because as I understand you to say, the study that is going forward now and is to be completed in 1961 is a complete study of the entire Potomac River Basin, embraced within that completed study is a water problem and a pollution problem of the metropolitan area.

Colonel WELLING. Yes, sir.

Senator BIBLE. Which we are directing our attention to this morning.

Colonel WELLING. Yes, sir.

Senator BIBLE. Now, if this report is not completed on those two phases of this overall study of the basin until 1961, must this com-

mittee await the completion of that report and go forward on the field of water and pollution in the metropolitan area?

Colonel WELLING. Senator Bible, I don't know how to answer your question. Mr. Gutheim and Mr. Hyde are familiar with both of these reports. I would defer to them if you want to do it. Naturally, you don't have to wait for that report. You can't wait for that report.

Senator BIBLE. I don't want to be in a position of having the cart before the horse. There is no purpose of trying to ask you a confusing question. I am just wondering if we will complete our labors, as I would expect we would, since we are under a congressional directive to complete by January of 1959, are we completing 2 years before we have a report of the very same problem?

Colonel WELLING. I can't explain that away too easily. It is the way I try to conduct it.

Representative HYDE. To carry your analogy a little further, perhaps the most the committee can do at this junction is start preparing the stable for the horse.

Senator BIBLE. You mean the organizational framework?

Representative HYDE. Organizational and financial, which would fit into your future recommendations made by a broad and overall study of the specific problems relating to water and pollution and conservation, and so forth.

Senator BIBLE. I just want to keep this thing in focus, if I can. You agree with that?

Mr. GUTHEIM. I think the study the Corps proposes to make is a major step in the continuing study of the Potomac Basin and its problems. I don't regard it as the end, any more than it is the beginning, of course. And it certainly seems to me that it does not in any way preclude the committee from making recommendations of an organizational, jurisdictional, and in many respects, of a financial nature.

Senator BIBLE. Very well. Mr. Levin, do you have a comment?

Mr. LEVIN. I asked this question of Colonel Sumner in a letter in which I inquired whether or not additional funds would help to conclude the study earlier because the 1961 date seems in the distant future, particularly when you add to it the 3 to 4 years required for construction of a dam upstream, if this is elected as a course of action.

I wondered if maybe this committee in reaching its conclusions, could not direct or try to direct or orient the study to the major points that our committee believes demands earliest attention, such as water supply. Would it be possible—a long way around to the question—but would it be possible to organize the study in a manner that would produce the water supply answer, perhaps water supply and pollution answer in advance of the 1961 date?

Colonel WELLING. Colonel Sumner is your best authority on that.

Senator BIBLE. Colonel Summer is coming later. I think possibly he testifies tomorrow, is that correct?

You may proceed, Colonel.

Colonel WELLING. Getting back to your staff report on water supply, our committee considers that just how water will be processed for and distributed to the various communities of the area to be of a relatively lesser importance and urgency since the great majority of the present

inhabitants are already served by a substantial water system. For the future, existing facilities should be exploited to their maximum potential so as to reflect benefits of past developments. There would not appear to be any compelling requirement for an overall area authority for this purpose. Distribution of water can well remain an activity under local, rather than area, administration. This would not prevent the physical integration of systems as might be desirable for convenience of operation and continuity of supply.

Of greater immediate concern is the protection of Potomac waters from sewage contamination such as to render those waters unsuited as a metropolitan water source.

There must be an agreement as to how metropolitan development upstream of the water intake can either be controlled or accommodated so that the purity of the Potomac can be assured.

Our committee has obtained approval of the regional conference to our proposal that no effluent from sewage plants be discharged into that reach of the Potomac from the mouth of the Monocacy Dam to Little Falls, and we are attempting to have that proposal accepted and enforced on a voluntary basis.

At our request, the Interstate Commission on the Potomac River Basin produced, in January 1958, the recommended Potomac River uses listed in Mr. Levin's report on sewage disposal and water pollution.

In our deliberations we have modified the recommended uses somewhat, but we are keeping our modifications under wraps in an effort to be sure of unanimity of approach with the State agencies involved.

Once all affected agencies agree on purity standards for the river, our next step will be to allocate to each jurisdiction how much pollution load it may contribute to the river. Such procedure should point the way to the kind of sewage disposal system the area requires.

Our committee has considered your staff report on conservation and recreation, which subjects are partially beyond the scope of our operations.

They need to minimize soil losses and to increase land yields if accepted. The need should be met by the employment of existing Federal, State, and local agencies.

In the field of recreation, existing planning bodies, if strengthened in the instances of the National Capital Regional Planning Council and the Northern Virginia Regional Planning and Economic Development Commission, should be sufficient to detail needs.

In general, it would be preferable to make more extensive use of existing agencies, especially at the planning level. For coordination of community efforts, the agencies closest to the people involved should be called upon. For basin problems, whenever more authority is required, development of Interstate Commission on the Potomac River Basin would be the preferred solution.

I thank you for your attention and assure you that our committee looks forward to working with you.

Senator BEALL. Mr. Chairman——

Senator BIBLE. Senator Beall.

Senator BEALL. Colonel, as an engineer and also with the Army Engineers, you have done such a splendid job everywhere you go, particularly in 1947 the job they did there, it was magnificent, and

really valuable for future use, but if you will recall there was tremendous opposition to doing anything at that time.

I am just wondering, along with the thought that Senator Bible had, how far we can go until we know more definitely what this new survey is going to bring out. Any recommendations that we have, may be of only part of a larger picture, don't you think?

Colonel WELLING. Senator Beall, I believe Mr. Gutheim or Congressman Hyde here said a moment ago you are going to cover largely the fields of organization.

Senator BIBLE. For instance?

Colonel WELLING. Whereas, the Corps of Engineers, in large measure, is coming up with a system of physical works, whether they be recreation plans or conservation plans or dam construction plans, and there should be a way of dovetailing your efforts this year into what they plan to do in succeeding years.

Senator BIBLE. Congressman Hyde?

Representative HYDE. Thank you, Mr. Chairman.

Colonel, I do want to take advantage of this opportunity to say one thing. You mentioned that you were wearing one of your many hats. I want to take advantage of this opportunity, on the record, to say that you wear most becomingly every hat that I have ever seen you wear, and are doing an excellent job for the District.

I want to compliment you very much, and compliment those who are responsible for the appointment of you here. The District is fortunate to have your services.

Now, with respect to this comment about regional organization, you mentioned the need for the protection of the Potomac from sewage contamination and water pollution, and that you had hoped to reach some agreement on a voluntary basis on degrees of contamination of the Potomac and other tributaries adjacent to the area within the jurisdiction of your committee.

Has your committee gone into any detailed study of possible jurisdictional conflicts which has led to the establishment of a regional control agency in other areas, such as on the lower Hudson, for example?

You reached some sort of an agreement about the degree of contamination which should be allowed in certain areas along the Potomac in the metropolitan region; and, as suggested by you, that would call for the necessity of some agreement about the allocation to the District, to Virginia and Maryland, as to just what kind of contamination they are going to pour in at certain points. But, without the regional approach to that kind of regulation, don't you see the possibility for conflict, for example, a competition for industry, let us say, and the industry is going to want to get the most favorable treatment it can, and 2 or 3 jurisdictions will be competing for this industry, and where you have the matter regulated on a politically segregated basis, isn't there going to be difficulty in regulation under that segregated system that would not be true if you had it on a regionally controlled basis under, say, one interstate regional body?

Colonel WELLING. Well, that possibility exists, but the fact of the situation here today is that during the 8 months that I have been here, we somehow have been able to introduce a situation of happy harmony, as I have called it.

Each of us in this metropolitan area, and our approach may not be regional from your point of view, so our approach is regional, each realizing something has to be done. We want to get together. We realize, each of us is going to have to give in, and we would rather give in voluntarily than to have some superagency imposed on top of us, over which we had no control; and until this voluntary approach of ours breaks down, and it may well do so, I indicated that possibility, those of us who are responsible officials in the local area, would prefer to continue the way we are going, and if we need further control we would look to the interstate commission in the pollution matter.

Representative HYDE. I want to emphasize in asking these questions that I am not suggesting any superagency over which none of the jurisdictions would have control, I am suggesting an interstate regional agency over which all three jurisdictions would have their fair share of control, such as we have had in some other river basins, and I keep referring back to the very good situation with respect to the Tri-State Commission in the lower Hudson. There, as on any interstate agency, the local jurisdictions do their own appointing of their members by virtue of procedures set up under the tripact maintain a large measure of local control.

So I want to make it clear that I am not suggesting a superagency, sitting up on a mountain some place, and handing down pontifical orders about what they should do in an area. What I am getting at more is a matter of organization, functional organization for a dealing with these problems on a cooperative basis, and I, too, would much rather see it handled on a completely voluntary basis. I think excellent progress has been made by your regional group—this regional group of which your committee is a part—along those lines. Very encouraging progress has been made and certainly we don't want to do anything to discourage that.

I just want to make it clear to all the persons involved, that no one, and certainly not I, have any idea of creating any superduper governmental agency to exercise any all-powerful control or to take control away from that other local jurisdiction.

Colonel WELLING. Mr. Hyde, when I look to the possible increased use of the Interstate Commission, do I answer your question there?

Representative HYDE. Yes; you did. And I assume that this report that you are reading has been approved by your committee; is that right?

Colonel WELLING. Yes, sir, and I don't want to go beyond what we discussed in our meeting last week.

Representative HYDE. So I take it, then, that your committee does approve perhaps more extensive use of the Interstate Commission?

Colonel WELLING. Yes, wherever more authority is required, development of the Interstate Commission on the Potomac Basin would be the solution.

One of these reports talk of a Federal Board of Review and Coordination. We recoil from that. It talks of a Federal Interstate River Basin Committee. We recoil from that. It mentions the Interstate Committee on the Potomac River Basin, and we look forward to that.

Mr. GUTHEIM. May I ask if the Washington Suburban Sanitary Commission is a member of the Washington Metropolitan Conference?

Colonel WELLING. No; they are not, nor is the Corps of Engineers.

Mr. GUTHEIM. Nor the Maryland National Capital Park and Planning Commission, nor the Interstate Commission of the Potomac Basin, nor other intergovernmental agencies concerned with this problem?

Colonel WELLING. No; they are not. This was an organization of elected officials, except for the three commissioners of the District of Columbia, and you know how we get our jobs.

Mr. GUTHEIM. Does the conference have any expressed attitude toward the work of these existing intergovernmental agencies?

Colonel WELLING. I can't speak for the conference, because this item was taken up only with the committee and not the conference. We only had a week here, I believe.

Senator BIBLE. Mr. Levin?

Mr. LEVIN. No questions.

Senator BIBLE. Colonel Welling, I can only say I hope that the happy harmony which you keynote prevailing in this committee preserves in this committee.

The next witness will be Mr. Paul Watt.

STATEMENT OF PAUL C. WATT, DIRECTOR, NATIONAL CAPITAL REGIONAL PLANNING COUNCIL

Mr. WATT. Thank you, Mr. Chairman. My name is Paul C. Watt, Director of the National Capital Regional Planning Council. I have been authorized by the Regional Planning Council to appear before you to present the policies adopted by the Council as they relate to this hearing in the field of water supply, sewage disposal and pollution, recreation and conservation.

These policies were adopted by the Council in November 1956 to serve as a guide to the staff in preparing the first general development plan of the National Capital region, which was also to serve as a basis for the transportation requirements currently being studied. (The document cited is printed below as part of the testimony of Mr. Bernard Frank.)

Prior to discussing the specific policies, it might be well to briefly establish what the Regional Planning Council is, and its role in the physical planning of the region. The Council was established in 1952 by act of Congress (Public Law 592). The Council is charged with preparation of a regional plan as well as the usual functions of a planning body. The regional plan is general in nature providing a guide to be followed by the representative planning agencies in the region in carrying out their precise local planning functions.

I might point out here again, as with Colonel Welling's committee, that even though our Regional Planning Council is sanctioned by Congress, we are a voluntary operating body. We have no authority to tell the various jurisdictions in Maryland, Virginia, or the District what they will or will not do.

The jurisdiction of the Council—the National Capital region—includes the District of Columbia, Montgomery and Prince Georges Counties in Maryland, and Arlington, Fairfax, Loudoun, and Prince William Counties, and Alexandria and Falls Church in Virginia. The land area of the region is 2,053 square miles.

There is attached to this statement a copy of the Policies for a Regional Land Use Plan for the National Capital Region, as well as other pertinent date for your information. As the preparation of the future land use plan has developed through studies of the existing land use, economic and demographic potentials, population projection, and distribution and physical growth factors, the importance of preserving a safe and adequate water supply has been of foremost importance. Corollary policies pertaining to sewage disposal, pollution, recreation and conservation, as they are inextricably bound to water-supply protection, are of equal importance.

If I may, I would like to take just a moment, Mr. Chairman, and refer to the map data to give you some feeling of the development of the region from this planning standpoint.

The first map you saw was the existing land-use map. That represented, in other words, just how the land was being used in 1955 when the field studies were made. I emphasize that this information was put together with the very fine cooperation of each of the planning agencies. They did the field work, compiled the data. That, in a sense, became our working map which shows how the land has now developed, gave us an idea where we might go in locating our future development.

The economic and demographic studies which I won't go into in detail, which were detailed studies, gave us an idea of what our employment growth might be in the various sectors of our economy, the birth and death rates, and their effect on the net immigration factors.

In projecting this population, we now have in the region approximately 2 million persons. In 1955, we had 1,864,000. Projecting into the future—we have 2 dates here we are working to—1965 whereby we foresee 2,400,000; and for 1980, somewhere between 3 million and 3,400,000 persons.

I emphasize we are not so much carried away by these dates. We would anticipate keeping close track of this. We may reach this 3,400,000 in 1970 or 1975, but in our fiscal planning we are geared to providing services and facilities for this many people.

Now if I may have the next map, please——

This is beginning to get down to the basis of your hearing in locating this future population which you saw distributed on the dotted map. We had to determine the physical factors in this region which would determine where this new growth could most logically and most ordinarily be placed.

The orange tone represents the urban area in 1955. In other words, that pattern is set. We have the large blue areas being Federal lands which are going to be employment centers, but most likely from past trends will not be residential areas.

The airports are shown here—Andrews and Chantilly. The green indicates both the existing parks and open space requirements for our population, as well as the proposed land area to serve a population of 3 million, plus.

Now, to us, one of the key factors on this map is critical watershed lines, which determine where our more intensive development can take place, and those areas where the policy of a lower density should be required.

Now if you can jump over, please, to the last map, I will very quickly close on this brief presentation. All of these factors were put together in trying to determine a 1980 land-use plan whereby we have taken all of the plans working through each of the jurisdictions and modified them where possible, through voluntary agreement.

Now the next one—to give some pattern of what we call the close development or intensive development, and then the areas of the green here being primarily those areas of more open development. As I get into the rest of my statement, I will touch on the policies that brought this about, which are primarily relating to water supply, sewage disposal.

The Regional Planning Council recognizes the Potomac River as a principal source of the region's water supply. In line with this, and since all of the engineering facts were available as to the details of providing the region's long-range water supply needs, the council recommended in order to assure future flexibility a decision that the land inundated by the proposed River Bend Dam, at Great Falls, be postponed until its ultimate use could be finally determined.

The council also stated that the secondary water supply sources on the Patuxent and the Occoquan should be protected.

Closely allied to water supply protection is the problem of sewage disposal and pollution. In its policy statement, the council stated that urban development should be so—

> designed as to prevent discharge of effluent from sewage treatment plants either into the Potomac River or into tributaries which flow into it between Little Falls and several miles upstream of Great Falls—

or into any other supply sources.

This policy is in keeping with the request of the Chief of Engineers, who is responsible for providing the District of Columbia water supply, in a letter to the chairman of the National Capital Planning Commission dated July 27, 1955, which states in part, that:

> It is requested that your Commission take such action in your planning as will discourage and preclude the discharge into the Potomac River upstream of the water supply intakes serving the National Capital, and that the various communities involved be encouraged to develop and activate a comprehensive master plan for sewerage and sewage disposal whereby sewage effluent will be discharged downstream of the water supply intakes.

The Council added, however, that carrying out its policy directive did not preclude development in the critical watersheds. It suggested that development could occur at densities low enough so that individual sewage treatment plans would suffice to protect the water supply, or where development was close enough to the watershed line, to make feasible pumping sewage effluent into a drainage area not involved in water supply.

Thus, the only way it seems to be possible to permit community development within the critical watersheds today—and I might point out that the critical sheds I have been referring to are shown by these dotted lines, and as you may see on the map, they represent the Potomac River, the primary water supply with the intake shown by the green arrows. The Patuxent, a secondary supply in Maryland, the Washington Suburban and Sanitary Commission, and the Occoquan serving a number of smaller water companies in Virginia.

Thus the only way it seems to be possible to permit new develop-

ment within these new watersheds today is to construct new works which do raise serious financial and organizational questions.

It should be added that there is considerable area for expansion in the region which can be properly serviced by sewer and water. The Urban Service map indicates this area within the critical watershed lines. This area encompasses approximately 700 square miles. If this area were developed at the average density in Arlington County—7,000 persons per square mile—it could accommodate nearly 5 million persons. As you can see from this map, the major problem to cope with is the location of Federal installations in the critical watershed areas.

In these instances it is not the installation itself which becomes the problem since they provide for the proper handling of their waste.

The real problem comes about when development follows the agency with resultant pressures for a higher density, so that this population can live nearby and have all the community amenities to which they are entitled.

Recreation and open space is not as critical as water and sewer problems, but extremely important in its own right, as the urban population mounts higher and higher over the years.

In its policy statement, the council listed this as one of the major planning problems, saying that—

> The purpose is not merely recreation, though this by itself would be enough, in view of the increasingly urban character of our population and the prospective increases in leisure time and standard of living; another important purpose is the preservation of flexibility in many kinds of future developmental decision, by making sure that the empty land is not all at the outer edge of a tightly built-up circle many miles in radius. A third is the saving of irreplaceable resources of scenic or historic value, and of valuable resources of agricultural activity. Yet, a fouth is the separation of clusters of development from each other, in such a way as to encourage the evolution of social relationships in communities of small enough scale to function as democratic entities.

In its preliminary plan, the council is proposing the reservation or acquisition of more than 10,000 acres of open space land which will be in recreational use, such as in regional parks and along stream valleys. A more difficult problem is to locate those lands closer in to the growing urbanization which can be protected from intense development and left in farms or institutions or private recreation.

The Council is at this time studying this problem and hopes to have a report ready for inclusion in the general plan this summer. The use of land for open space in the critical watersheds need not threaten the water supply. Indeed, prohibition here of intense development will not only protect the water supply but will, at the eame time, make it easier to provide recreation areas.

Thank you for the opportunity of presenting the views of the Regional Planning Council. Should there be any additional information we can provide you, we will be most anxious to be helpful.

Senator BIBLE. I very much appreciate your statement, Mr. Watt. Will you put me clear as to what the green represents on the map that is before us? Is that the projected area for the metropolitan growth?

Mr. WATT. Senator Bible, that is the area that can be served by sewer and water at this time.

Senator BIBLE. Projected until 1980?

Mr. WATT. Yes, in relation to these policies. In other words, we assume that there would be no intercepter lines up across these water-

shed lines. However, there could be a fringe of development across the watershed lines which could by forced main pumping over into the adjacent watershed, and thus into some sort of a system.

Senator BIBLE. Do I understand your projection, you say in 1980, anticipated population within the area in green is something in the neighborhood of 3,400,000?

Mr. WATT. No, sir; the 3 million population would include a considerable population beyond those watershed lines. However, that population would be at such a density they could provide their own septic tanks or wells and would not be a serious problem in relation to water supply.

There, we would hope by working with each of our jurisdictions and in relation to their zoning policy to develop such a program. It may not be the ultimate answer, but it is the only tool we now have to work with.

Senator BIBLE. How does the adequacy of water supply from these—do I understand that the 1, 2, 3, 4 and 5 green triangles indicate the critical watersheds?

Mr. WATT. They indicate the water intakes.

Senator BIBLE. Intakes?

Mr. WATT. Yes, sir. For instance, this one on the Potomac is the new Little Falls intake. The one upstream at Great Falls, and 2, Brighton, and Rocky Gorge on the Patuxent River and one at Occoquan.

Senator BIBLE. Are there sufficient water supplies to take care of the needs of an area as large as you have shown in green, of a population of approximately 3 million people?

Mr. WATT. We do not believe so. We believe inevitably we are going to need the major source of supply on the main stream of the river.

Senator BIBLE. By river, you mean the Potomac?

Mr. WATT. Yes, sir. We would recommend the secondary supplies be, from a defense standpoint as well as otherwise, be available to tie into whatever future work might be.

Senator BIBLE. Has your council come up with any recommendations as to the type of organization that would take charge of this overall problem of, first, water supply, second, sewage disposal?

Mr. WATT. No, sir; we have not as yet come up with any recommendation. We are very much aware of this problem. I might say from our planning viewpoint, preparation of these plans from a technical standpoint can be carried out.

It is the implementation of the plans that become the difficult problem, and we are now reviewing the possibility.

We are looking with a great measure of hope to the activity of your committee as well as the work of the Metropolitan Regional Conference that Colonel Welling mentioned and, of course, reviewing the staff reports as to organizational possibilities.

I might make one further statement in relation to the mass transportation study. The closing phase of this study is in the hands of the Institute of Public Administration, headed by Dr. Luther Gulick, and we are hoping from his studies and the type of overall organization that might be required for transportation, there might be some clue as to some of these answers for us.

Senator BIBLE. You have no specific recommendations as a council on organizational setup on these two problems at this time?

Mr. WATT. Not at this time.

Senator BIBLE. Do you go into that phase of it in your council studies or not—you do more or less planning and the engineering side of this problem?

Mr. WATTS. We do mostly the planning, and I think in planning you can't do a complete job without giving considerable thought to proper organization. However, our council at this time, I feel, does not believe they have sufficient data to come up with any recommendation.

Senator BIBLE. You say at this time. Do you contemplate that in the next 6 months you will have some recommendation on that phase?

Mr. WATT. I would hope so. I don't know as I can specifically commit the council, but to answer your question, I would hope so in the very near future.

Senator BIBLE. I think it would be helpful to this committee. I think we should have your recommendations, organizationalwise, because I think that is one of our real important problems, prior to the time we come up with our final finding, rather than have us come up with a final finding and you people come in back of us and say no, you set up the wrong type of organization.

Mr. WATT. I am certain they do not want to do that, and I will carry this message back to the council and see if we can't get some sort of report to you as to their intentions in this matter, so that it fits together with your program.

Senator BIBLE. I am a great believer of studies of this kind and I think this is a worthwhile study and very complex and intricate and it is a difficult field. I am a great believer that the end of these studies, it behooves all of us to come up with some 1, 2, 3, 4, and 5 recommendations that everybody can understand and know what we are driving at.

Mr. WATT. Yes, sir.

Senator BIBLE. Thank you, Mr. Watt.

Congressman Hyde?

Representative HYDE. I, too, Mr. Chairman, want to emphasize your point. This committee is going to be primarily concerned in connection with these problems, with the matter of administration and financing of the problems.

Mr. Watt, has your council considered the questions raised in Mr. Levin's reports?

Mr. WATT. Not specifically, Representative Hyde. However, in reading Mr. Levin's reports and talking this over with the regional council at our meeting, we felt that our policies as they now stand closely dovetail into some of the major items in that report.

Now as to answering some of the specific questions we have not had the time since our meeting to do so, but should there be a desire to present further data back to your committee, relating to some of the specific questions, here, again, I shall take this back to the council.

Representative HYDE. Well, speaking for myself as one member of this committee, I would appreciate whatever help the council can give us with respect to answers to the questions raised by Mr. Levin in his report, because I think they are very pertinent questions, the answers to which are going to be very helpful and necessary to this committee.

Mr. WATT. Yes, sir.

Representative HYDE. Now, on the item of recreation, and the need for open space and green areas, I gather that your council has come to the conclusion that there is a good deal of urgency in the need for money and action now, before it becomes too late or too expensive for providing for such open spaces and recreational areas.

Mr. WATT. Yes, sir, that is very true, and I shall include as an appendix to these remarks a resolution that the council just adopted in this field where they have tried to block out a guideline of study and program for land acquisition at all levels of what might be parts of a Federal system in terms of demographics and right on down to the local level that they tried to start now—which has just been done in your county, Montgomery, of using local funds to acquire regional park areas.

As this new growth is going outward, the tendency now is toward a horizontal development, using more and more land for living and unless we can preserve the open spaces, not only the public and private, the country clubs and golf courses that are sometimes gobbled up, we feel we can have a chaotic pattern if this is not stopped.

Representative HYDE. Well, I gather from what you say, your council does intend to come up with some specific requests and recommendations along these lines?

Mr. WATT. Yes, sir.

Representative HYDE. And does your Council consider that an important tool in connection with conservation in the area?

Mr. WATT. Yes, sir.

Representative HYDE. As it relates to the water supply problem?

Mr. WATT. That is right.

As I mentioned, even though the Council has not specifically recommended River Bend, they have said that until all of the facts are in from the Corps of Engineers' studies, we should show that land as conservation land; the land will be inundated so if a dam at that point is the answer, it will be developed and the costs to come in and buy back land will be that much greater.

Representative HYDE. Thank you.

Senator BIBLE. Mr. Gutheim?

Mr. GUTHEIM. Mr. Watt, you refer to the Council's feeling that above these water intakes, measures of watershed protection and conservation should be undertaken. Is it possible that the Council's plans would provide specific guidance that would integrate this watershed policy with recreational space of some kind?

Mr. WATT. Yes, sir; I would hope so.

Mr. GUTHEIM. Multiple use of the areas involved?

Mr. WATT. Right.

Mr. GUTHEIM. These would be plans that would be employed both locally and by State governments, as well as the Federal Government itself?

Mr. WATT. That is right.

Mr. GUTHEIM. And you feel that such plans would be implemented perhaps through the Capper-Cramton program, and otherwise as far as regional parks are concerned?

Mr. WATT. That is an area that we are studying. We have the special open-space study that I mentioned, in which one of the items for study was the status you might say of the Capper-Cramton program.

Is it going to continue as of now or should it be beefed up into some other approach? I cannot answer you at the present time, only to say that that is an area which is being studied and we are very much interested in utilizing the local resources as much as possible in coordination.

Mr. GUTHEIM. Could this conceivably lead to proposals that in addition to the land immediately required by a Federal agency for a dispersed headquarters location, additional lands might be required for further related purposes of this type?

Mr. WATT. I would say a very great possibility.

Mr. GUTHEIM. When do you anticipate that the Council's open-spaces reports will be published?

Mr. WATT. Well, we ran out of funds about halfway through our outline program, but we have a progress report that is being analyzed by the committee, and their recommendations made from it, and it is in the process of being digested for publication, we hope within the next 30 to 45 days. As soon as that is available, we will make it available to you gentlemen.

Mr. GUTHEIM. Public Law 592, under which the Council is operating, provides for the review by the Council of proposed decentralized locations by Federal agencies, does it not?

Mr. WATT. That is right.

Mr. GUTHEIM. Could you outline for the committee the nature of that review? I know there are several steps the Council takes with the Planning Commission.

Mr. WATT. Yes, sir, I would be very happy to do so. Very briefly, according to the law, the Federal agency that is going to relocate in the District of Columbia need only go to the National Capital Planning Commission as the central planning agency for the Federal Government for review. However, should it be an agency that is coming out to Maryland or Virginia, it first goes the National Capital Planning Commission, who then refers it to the National Capital Regional Planning Council, who then discusses the whole matter with the local jurisdiction most affected.

For instance, if it is in Fairfax County, it goes to the Fairfax County Planning Commission and their governing body, and they submit their feelings back on the matter to the Regional Planning Council, who adds any suggestions or recommendations they may have, and passes it on to the National Capital Planning Commission, which in turn, adds its comments, blessings, or what may be, and then transmits this back to the Federal agency involved. If it is positive, in what they want, that is the end of it. However, should the planning agencies rule in the negative, keeping in mind that the planning agencies are only recommendatory and in an advisory capacity, then the Council is required to state why it does not agree with the agency—and the agency goes back down the line, and a final review comes back through the same steps. Then it is up to the agency.

If it is still negative from the planning standpoint, then they make up their own mind if they want to follow the directive of the planning people, or go ahead on their own.

Mr. GUTHEIM. You think this gives an ample opportunity for the expression of a local interest in this matter?

Mr. WATT. Yes, it certainly does.

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Senator BIBLE. Congressman Hyde, did you have a question?

Representative HYDE. Yes, I don't know whether you care to comment on this or not, but don't you think the present administrative setup leads to more confusion then is necessary?

Mr. WATT. Well, it certainly is a difficult set of steps to go through, particularly in our voluntary association relationships. In other words, at the Council level, if we feel one way and the jurisdiction another, there is no way of our saying you are wrong or you are right. You have to kind of line up. I would say all around, it is difficult.

On the other hand, it is a democratic process, I presume, and on that basis it carries through. Whether it is sufficient, and operates with dispatch is another question.

Representative HYDE. Well, of course, there is no basic reason why we can't improve democratic processes, and I gather from the statements that the Regional Council has made in the past particularly, those made to Senator Bible and myself sometime ago, that the Council feels there is a need for a change in that planning setup.

Mr. WATT. Yes, they have expressed that need.

Senator BIBLE. Mr. Gutheim?

Mr. GUTHEIM. Mr. Watt, you refer to the fact that these Federal installations which constituted, as I believe your statement mentioned, one of the problems in preserving the integrity of our water supply system, typically take care of their own sewage disposal problems. This, I presume, means secondary treatment.

Now, you also said that in addition to the impact upon water of the headquarters installations themselves, there was a secondary effect which these installations had in stimulating and encouraging other development in area.

Could you suggest some of the things that would be likely to take place as the result of a large installation of the caliber, say of the National Security Agency, at Fort Meade, or the Central Intelligence Agency, at Langley, or the Atomic Energy Commission at Germantown?

Mr. WATT. I would be expressing these pretty much as I see them because there has been some difference of opinion in locating these agencies—but the real problem as we see it from a planning standpoint, is that once a facility of the magnitude of those Mr. Gutheim has mentioned goes into one of these areas, they usually arrange to handle their waste through pumpovers into another watershed or their own treatment plants. However, the population that follows such an agency is something else again that may not be as easily taken care of both from the standpoint of providing the community facilities, sewer and water, and again the problem of highway networks.

There may be only a bare system of highways in one of those areas, and when a large working population comes in, plus little shopping centers that spring up, and a service population begins to come in, you have a great load on your highway and other requirements. And then of course, your open space needs come in.

If you haven't the money to acquire the open spaces as they develop, you may lose them, and it can become a problem. A lot of it depends on how well equipped the local jurisdiction is to take care of these matters. But in this past era of boom, we have had more to do than funds would allow in most of our growing parts of the region.

Mr. GUTHEIM. Mr. Watt, I am going to insert in the record at this point some aerial photographs that show some of these representative dispersed establishments.

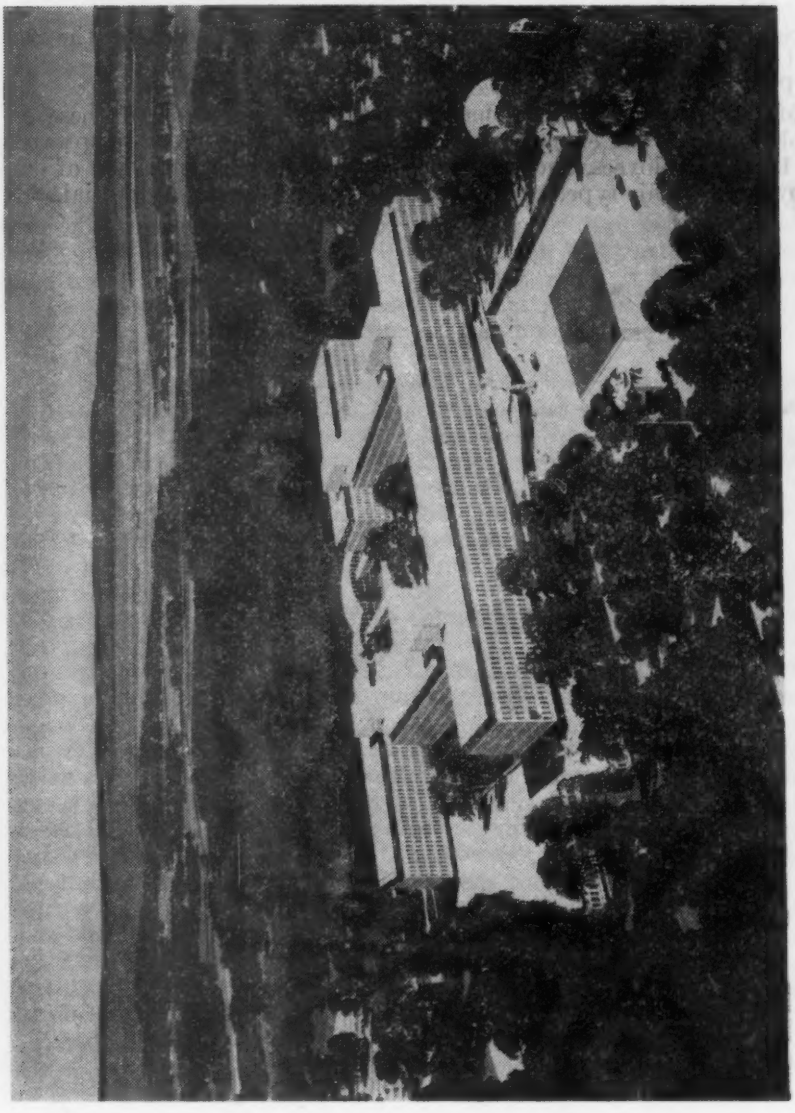
I have here the National Security Agency, the Atomic Energy Commission, and a design for the Central Intelligence Agency Building at Langley.

Senator BIBLE. Without objection they will be inserted in the record at this point.

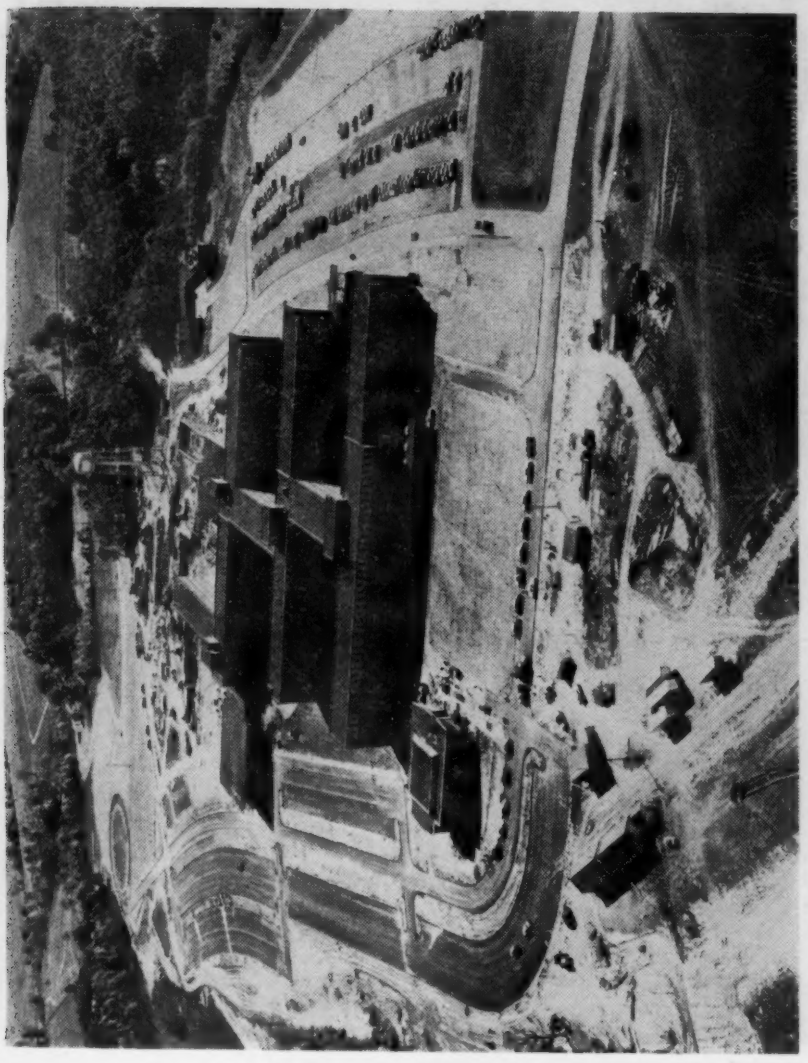
They are inserted in the record now for what purpose?

Mr. GUTHEIM. To get some sense of the magnitude of these establishments. For example, both the NSA and the CIA have upwards of 12,000 employees, and the impact of a major concentration of employment of this type, as Mr. Watt has said, is very substantial.

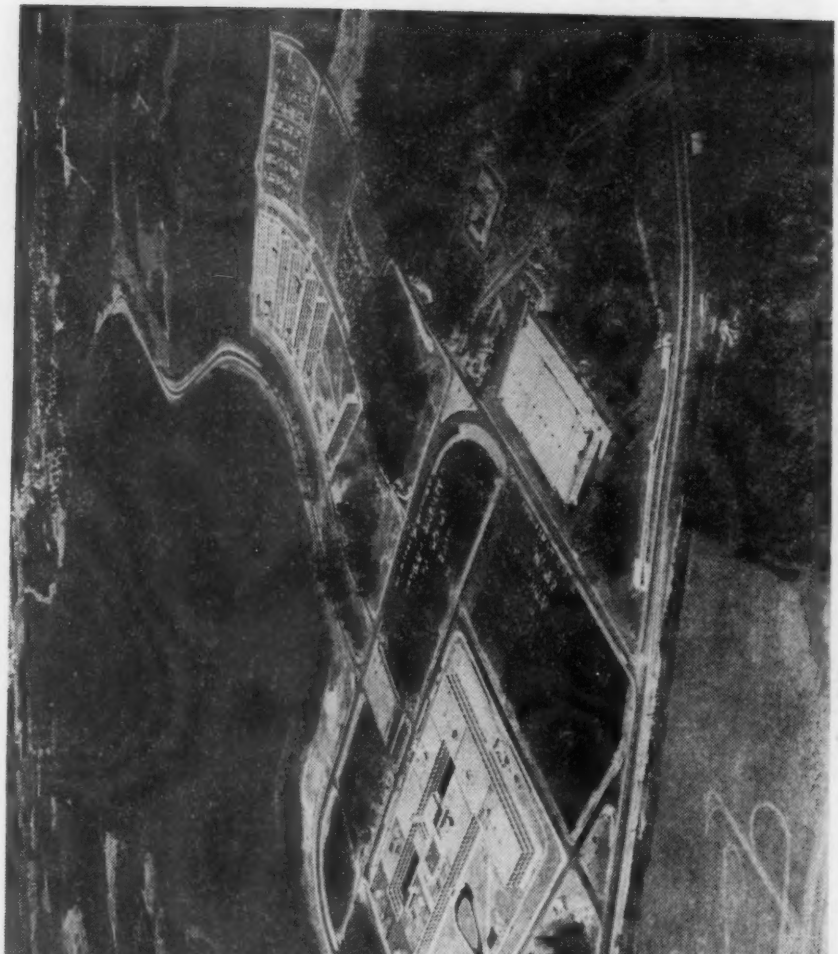
(The photographs referred to are as follows:)



CENTRAL INTELLIGENCE AGENCY



ATOMIC ENERGY COMMISSION



NATIONAL SECURITY AGENCY

Mr. GUTHEIM. Now, the Council's policy in preventing dense development which would require the development of new, separate sewerage treatment plants in these watersheds is motivated by the desire to prevent the discharge of sewerage effluent into our streams above the water intake points.

Mr. WATT. Yes, sir.

Mr. GUTHEIM. Not only from the Government establishments, but also from the related residential and commercial and industrial and other possible development that would follow.

With particular attention to the Central Intelligence Agency, would you describe how the Regional Council came to approve this installation which appears to be contradictory to the policy which the Council has?

Mr. WATT. Well, I want to make this as brief as I can. Probably, those of you who were here during this particular discussion know that it was before the Council and the other planning bodies for quite some time. And the ultimate approval by the regional planning council, on a fairly close vote, was on the basis that the Central Intelligence Agency itself would do certain things. Among them, of course, would be to provide their water and take care of their discharge of wastes in such a manner that they would not affect the safety and the purity of the water supply at Little Falls.

Mr. GUTHEIM. This would apply of course to the Government installations only, and not to the related secondary problem.

Mr. WATT. Now, as to the related secondary growth, there was considerable difference of opinion as to just what magnitude this secondary growth might be. And on the basis of this, I believe, Fairfax County stipulated that, with their sewer program that was underway, they could handle the growth that came in this area. They would also try to maintain as closely as possible the character of development that is there now. And the Virginia Highway Department said they would do certain things in terms of making highways available. And the CIA itself, as I remember, was able to get funds applied to the George Washington Memorial Parkway which would bring that more quickly into being.

So putting all those together, that brought about the favorable approach.

Now the overall question as to conflict of our policy—I, at the staff level, felt that it was in conflict with this policy that I have read. I must emphasize, however, this policy had not been adopted at that time. The council was just in the throes of trying to put its policy together, and that in itself made it more difficult to give guidance to the regional council that might be more beneficial.

Also, there was some feeling that the traffic problems that would be involved might be very difficult to handle and would require siphoning of more funds into that area over a shorter period of time.

These were the two sides of the conflict as it was carried to its close.

Mr. GUTHEIM. If I may summarize, then, the council's approval of the Central Intelligence Agency's location at Langley was made after they had been assured by the local agencies in Fairfax County, the Fairfax County Planning Commission, and so forth, that the necessary steps would be taken to provide for the construction of sewage facilities that would prevent the pollution of the Potomac River?

Mr. WATT. That was my understanding; yes, sir.

Mr. GUTHEIM. Do you feel that these assurances, in the light of the experience over the last 2 years, have been warranted?

Mr. WATT. That is a difficult question to answer, as even still some of these problems are in the process of being worked out.

Mr. GUTHEIM. You feel it is premature, in other words?

Mr. WATT. Yes.

OUTLINE OF REGIONAL PLANNING PRINCIPLES TO BE APPLIED IN EVALUATING THE RELATIVE MERITS OF SITES FOR AEC HEADQUARTERS BUILDING, SUPPLEMENTING AGENCY REQUIREMENTS AND CRITERIA

National Capital Planning Commission, National Capital Regional Planning Council, August 4, 1955

1. COMPREHENSIVE PLAN RELATIONSHIPS

(*a*) Consistency of the proposed location with the policies relating to proposed Federal establishments in the National Capital region as set forth in the comprehensive plan for the Nation's Capital and its environs.

(*b*) Adaptability of the proposed location with the official master plans for the local jurisdictions.

2. COMMUNITY FACILITIES

(*a*) Location should be in the vicinity of a nucleus or potential nucleus for a suburban community where public facilities and services are readily available or obtainable, such as schools, commercial establishments, housing, etc.

(*b*) Location should have available local access capable of providing an increase in traffic volume of 700 vehicles during peak hours.

3. RELATIONSHIP TO REGIONAL WATER SUPPLY AND SEWAGE DISPOSAL POLICIES

The location should be such as to permit the disposal of sewage from the Federal installation, and from potential private development resulting from that installation, into such watercourses and to such a degree of treatment and dilution as not to affect adversely any existing or proposed source of water supply or to degrade the water quality standards recommended by public authorities. Bilateral agreements, designed to safeguard water supplies and to secure equitable use of supply sources, should be entered into by both Federal and State authorities having control, or desiring to establish the required control, before commitments are made as to any location.

4. PLANNING CONTROLS

Local subdivision and zoning regulations should be adequate to properly guide the likely new private development resulting from any Federal employment center as well as protect the already established land uses.

NATIONAL CAPITAL REGIONAL PLANNING COUNCIL, WASHINGTON, D. C.

RESOLUTION

Whereas the Committee on Parks, Parkways and Open Spaces has been reviewing in detail the progress report, Open Spaces for the National Capital Region, submitted by Charles W. Eliot, consultant; and

Whereas the recommendations submitted in this report have been carefully reviewed and reconciled with the views of the Committee;

It is therefore recommended that the National Capital Regional Planning Council approve the following:

I. For immediate action by the 2d session of the 85th Congress

A. George Washington Memorial Parkway.—Request positive action by the appropriate State and local authorities recommending a favorable report by the Senate Committee on Interior and Insular Affairs, to the Senate Appropriations Committee, on the desirability and need for completing the George Washington Memorial Parkway in Prince George's County, Md.

Such action is necessary to assure the matching of Federal funds, and to establish the basis of the agreements under which both acquisition and development will take place.

B. Maryland Stream Valley Parks.—Request the Senate and House District Committees to hold hearings and expedite approval of S. 928 with amendments proposed by the National Capital Planning Commission and approved by the Bureau of the Budget, to effect a transfer of existing authorization which will allow the following Maryland Stream Valley projects to be undertaken without delay:

Units No. 6 and 7, Rock Creek Park, Montgomery County.
Unit No. 4, Northwest Branch Park, Montgomery County.
Unit No. 2, Cabin John Creek Park, Montgomery County.
Unit No. 1a, Oxon Run Park, Prince Georges County.

(This bill does not include any substantive change in the Capper-Cramton act, but will permit transfer of fiscal authorization from the George Washington Memorial Parkways to the Maryland Stream Valleys.)

II. For immediate study in preparation for early action by the next Congress

A. Request each jurisdiction to reevaluate the proposed land acquisition program under the Capper-Cramton act for the purpose of determining—

1. The adequacy of existing legislation to accomplish the program as heretofore planned, and
2. The necessity for expanding the existing program to meet estimated future needs.

B. In furtherance of the above, the committee recommends that consideration be given to the following:

1. George Washington Memorial Parkway:

(*a*) Revision of routing of parkway through Alexandria, Va., to the proposed waterfront location by appropriate revision of present legislation.

(*b*) Include in the parkway an area in Maryland opposit Mount Vernon, which is in the main view from the mansion.

(*c*) Enlarge and extend the parkway on both sides of the Potomac above Great Falls.

2. Maryland Stream Valley parks: Reconsider the entire Maryland Stream Valley park system for possible extensions and additions, and revise cost estimates for purchases.

3. Virginia Stream Valley parks: Preparation by one or more Virginia park authorities of a general park plan which can be used as the basis for the submission of estimates for public park acquisition as authorized under Public Law 592, approved July 19, 1952.

C. General: Investigate the feasibility of obtaining Federal and State legislation which will provide for the establishment of a joint revolving fund for acquisition of lands for public use. (Committee to discuss this item specifically.)

III. For immediate consideration at local levels toward early action in acquiring needed open space

Because of the progressive loss of valuable open spaces and the slowness which Federal funds have become available, it is imperative that these needed lands be acquired. A concerted effort should be made by all jurisdictions to make the necessary funds available for land acquisition, keeping in mind the successful program just initiated in Montgomery County in Maryland, and the steps being taken in Fairfax County in Virginia.

VI. For continuing study relevant to the preservation of existing open spaces (special committee may be required)

A. Transfer of jurisdiction.—

1. Inside District of Columbia: Renew efforts for achieving transfers of Government properties needed for the District of Columbia park recreation system, such as west edge of Soldiers' Home, National Training School, St. Elizabeths Hospital, Camp Simms, etc.

2. Outside District of Columbia: With respect to the George Washington Memorial Parkway, the National Capital Planning Commission should, as soon as feasible, proceed to exercise the authority now granted in the Capper-Cramton Act to occupy such lands belonging to the United States as may be necessary for the development and protection of the parkway.

Example: The St. Elizabeths farm and part of the Bureau of Public Roads property at Langley, Va.

3. Outside of the District of Columbia: With respect to other public lands to be kept as permanent open space (not surplus category) regardless of jurisdiction, legislation should be sought to permit exchanges of jurisdiction, or ownership, by Federal, State, and local agencies, for this purpose. Such authority should include easements where transfers of jurisdictions are not essential, or practical.

B. Disposal of surplus United States real estate.—Obtain authorization for the National Capital Planning Commission to review proposals for the disposal of surplus United States real estate in the National Capital region prior to the offering of the property, permitting the Commision to check with local planning agencies before making its report.

C. Areas reserved for future public use.—Obtain for Federal and Virginia planning agencies authority similar to that granted by the Maryland Legislature, which permits the Maryland-National Capital Park and Planning Commission to designate and reserve areas for future use on an official plan, thus withholding such areas from private development for a period of 3 years, during which time no taxes are levied. At the end of the period the reservation expire unless the land has been acquired.

D. Official map.—Obtain authorization for Federal and local planning agencies to adopt the "official map" procedure, extended to include parks, drainage, and conservancy areas as well as streets.

E. Zoning, open space uses.—Ascertain from competent legal counsel, after intensive investigation, the adequacy of District, Maryland, and Virginia Zoning Enabling Acts to enable jurisdiction in those States to establish zoning districts for various kinds of open space use.

F. Deferral of part of the real-estate tax.—Obtain for local jurisdictions authority to defer part of the real-estate tax on properties shown on a master plan and zoned for open space use, with payments of the deferred portion of the tax when the zoning or use is changed, thereby reducing the pressure upon owners of such lands, and the speculative activities associated with such lands.

(Revised April 21, 1958.)

Senator BIBLE. Mr. Levin will have some further question.

Mr. LEVIN. You stated that the Council has taken a stand against the discharge of untreated effluent above the District of Columbia water-supply intake?

Mr. WATT. Yes, sir.

Mr. LEVIN. Has it taken a stand on similar discharges below that intake, from the points of view of public health, recreation, conservation, throughout the metropolitan area?

Mr. WATT. If I follow, you mean on down the river, such as Pimmit Run and some of the others?

Mr. LEVIN. That is correct.

Mr. WATT. I would say this, Mr. Levin—that the council, in its deliberations, would be opposed to any discharge that would appreciably raise the level of pollution in the river. They have not as consistently spelled this matter out, feeling that this, in their regional work, and in keeping with the Interstate Basin Commission's work—that this is being worked out more or less at a local-policy level. On the regional basis, they would be against pollution, you might say. But they have not tried to be as definitive downstream as they have upstream. That may be something we will want to look further into.

Mr. LEVIN. You mentioned that the Council has recommended the reservation of some 10,000 acres of open space for recreational purposes?

Mr. WATT. Yes, sir.

Mr. LEVIN. Would not much of this open space preferably border streams in this area?

Mr. WATT. That is right. I would say, just offhand, 50 percent of that would be in terms of recreational parks which might be located more advantageously to serve the population, and the remainder would be in stream-valley conservation, along the main stem, as well as many of the tributaries.

Mr. LEVIN. Do you believe, then, that the discharge of treated sewage effluent to these small tributaries would be detrimental to your program of developing these areas for recreational use?

Mr. WATT. I would say very definitely it would.

Mr. LEVIN. I would like to bring this exhibit out, if I might. This chart that is now being used will be found in the water-supply report that the committee has published, page 8, figure 2.

Senator BIBLE. The record will show that the map or chart to which Mr. Levin has directed his remarks is found on page 8.

Mr. LEVIN. Each of these red symbols designates a source of sewage discharge to a stream or the Potomac River in this area. Do you believe, Mr. Watt, that, if many of these sources of discharge could be consolidated, and the ultimate discharge from consolidated sources could be removed further downstream, this would be in keeping with the aspirations of your council to promote better recreational use of these lands?

Mr. WATT. Yes, sir; I do.

Mr. LEVIN. Do you believe that the recreational opportunities are required, and that, even if additional funds might be necessary to achieve this cleaning up of the whole streams, you believe this would still be desirable?

Mr. WATT. Yes; I would say so.

Mr. LEVIN. Thank you. One further question on the other map. You pointed out the location of the Great Falls intake, which is the present source of water supply for the District of Columbia, and the new water-supply intake at Little Falls. Has your council taken a stand on the moving of the main water-supply intake, which is what the Little Falls intake will ultimately become, closer toward the center of population, closer toward the developed area, and what do you think might be the effect on the water supply?

Mr. WATT. They have not, Mr. Levin, taken any particular stand as to whether it should be Little Falls or Great Falls, but, rather, if both of these are water intakes, every effort should be made to protect and preserve the water supply in between. But they have not taken any action, such as saying they would prefer to see Little Falls rather than Great Falls used as the primary intake.

Mr. LEVIN. You suggested that every action be taken to protect the water-supply intakes. Now, this action will obviously mean the restriction of the development in the area above the water-supply intake?

Mr. WATT. That is right.

Mr. LEVIN. These seem to be quite valuable lands, particularly in view of the population growth we are experiencing. Did you think that it might not have been worth the added price to construct the intake somewhat farther upstream, and thereby require a longer conduit, than to preclude from full development the areas above that intake at the present time?

Mr. WATT. This was discussed in quite some detail quite a number of times by the Council, primarily through their water-supply and sewage-disposal committee. And at these hearings they had the benefit of Mr. Tisdale, Mr. Auld, and Colonel Adams, who at that time was district engineer. And there was considerable feeling that there was not enough teeth in planning today to carry out the policy that we are now describing, and that we should think of interceptors and, maybe, intakes even farther upstream, either collecting sewage or collecting effluent. The Council felt, in view of the conditions as they saw them, and reflecting also some planning viewpoints, that it wasn't maybe, necessary to have just high-density development everywhere; that there may be areas that are best suited for a little more open density, such as has been the character of development in this area, and maybe it should be preserved, rather than just turning it over to a higher density development.

So, in putting all of this together, the timing, the status of planning in each of the areas, they felt that this was the policy that they should try to follow at this time. We hope the planning is flexible, and, if there are other solutions to this, as we develop, and from your committee activity, we would certainly wish to review all our policy as this whole matter develops.

Senator BIBLE. Thank you, Mr. Watt.

Do you have any further questions?

Mr. LEVIN. One final question. The District of Columbia is, perhaps, unique in that it controls not 1 square foot, so to speak, of its watershed. And is your council still of the opinion that there is not enough teeth in the existing legislation and existing planning to protect the water-supply intakes?

Mr. WATT. I certainly feel that way. I don't know as I can speak for my council. I know some of them feel that way.

Senator BIBLE. Mr. Gutheim.

Mr. GUTHEIM. Mr. Watt, it will be very helpful, I think, to the committee, if the last last two maps in particular, the one that is now shown on your broad and the one below, can be left here for this afternoon and tomorrow. Would that be possible?

Mr. WATT. We would be happy to leave all of them.

Senator BIBLE. Thank you. Are there any further questions?

Mr. HYDE. Just one more question. I gather, from the colloquy between you and Mr. Levin that just preceeded, that the policy you suggested is responsible for what appears to me to be a rather conservative estimate regarding the extent of this green area along the north and west up the river. Do you anticipate that, in view of possible flooding, in view of zoning, either zoning restrictions or development policies, that will not be a high-density area out along the river?

Mr. WATT. Yes. Both taking the existing conditions, the Potomac area, for instance, on the Maryland side, and the Langley Forest area, the McLean area on the Virginia side—the present development has been what we might categorize as the small estate type of development—3, 4, 5 acres, a lot of it. And we have felt in trying to preserve the water supply, this sort of development was a healthy pattern.

Your zoning in Montgomery County somewhat follows this, the break being just across the Cabin John sewer. This area's comprehensive planning that is being done by the Maryland Commission is

trying to carry that out. And as I mentioned with relation to the CIA, the Fairfax Planning Commission is trying in their planning to, we hope, give assistance to this.

So that the only point that I want to emphasize is that while this is a restriction on growth, it doesn't preclude it. There can be a tremendous amount of growth in that area. However, it may be only 1, 2, 3, 4 or 5 persons to an acre.

Mr. HYDE. Would the change in that water intake location make any possible alterations in your projections for that area?

Mr. WATT. It could, yes, particularly on the Virginia side.

Mr. HYDE. Thank you.

Senator BIBLE. Thank you, Mr. Watt, we very much appreciate your testimony.

The next witness is David Auld.

You may proceed.

STATEMENT OF DAVID V. AULD, DIRECTOR OF SANITARY ENGINEERING, DISTRICT OF COLUMBIA

Mr. AULD. Thank you, Mr. Chairman.

Like the previous witness, Mr. Watt, I work under the direction of Colonel Welling. Colonel Welling, as you know, is the chairman of the Regional Planning Council, of which Mr. Watt is Director, and he is also the Engineer Commisisoner and I am his Director of the Department of Sanitary Engineering.

It is gratifying that your joint committee in its study of metropolitan problems is giving first consideration to matters concerning the Potomac River and the relation of water supply and water pollution to the metropolitan future. Having devoted my entire professional life to water and sewer system operations and improvements for the District of Columbia, I fully concur in your conclusions as to the key role of these services in our modern civilization.

The Potomac River in 1853 was selected as a source of water for the National Capital although its potential then far exceeded the maximum conceivable requirements of the city. The wisdom of this choice has never since been doubted. Even after over 100 years of growth since then and with the approach of saturation development in the city itself, the Potomac is still adequate.

If we were a community alone we could expect the river's unregulated flows to fully satisfy our water needs, perhaps forever. Only the advent of metropolitan development has changed this—and now, almost suddenly, we find ourselves in competition with the future millions of the area for the river's resources which will be insufficient for all unless carefully developed and controlled.

The assurance of metropolitan growth and the security of Washington itself depend most of all on a guaranteed water supply such as only the Potomac can provide. Since the form of basin development and the manner in which flow control can be achieved are now altogether in doubt, the key to the future of the metropolitan area lies in the making of firm decisions predicated on adequate studies and recommendations by the many agencies having responsibilities in the resources field.

The present Potomac Basin survey by the Corps of Engineers must be accelerated in all ways possible so the many choices with which we as a basin population will be confronted may be brought into focus and from these, suitable courses of action selected.

It must be remembered that major engineering works usually require about a decade to materialize after a decision to proceed. With a minimum allowance of several years for completion of current studies before decisions are possible, it is not inconceivable that metropolitan demands would on occasion exceed the natural river flows before suitable control works are in operation.

Your committee will doubtless receive many suggestions as to possible methods of avoiding the construction of major improvements for this purpose. Those involving the reclaiming of raw or dilute sewage by distillations or atomic means for reuse as drinking water are bound to appear.

No such alternatives have been or are likely to be developed for wide-scale use in time to satisfy the inevitable water needs of this area. We have seen nothing beyond conventional practice which so far holds any promise of guaranteeing a certain water supply at a price people should be asked to pay.

Mr. HYDE. Excuse me. You are not reading it from the statement?

Mr. AULD. I departed from that, Mr. Hyde. Sorry.

Except for the matter of an adequate source of supply, the District of Columbia as a city has no water problem. Eleven years ago we put forward a construction program for water system improvements. These have since proceeded at an adequate rate and for the city alone I can see no impending difficulty. We now have in the making one of the best engineered and most dependable water systems it is possible to build.

The work which we believe to be necessary can be carried to completion with our own resources. We are in sound financial condition and anticipate that earnings under rates already authorized by Congress should fully serve the debt we have contracted. There is no indication that the flight to the suburbs, which has caused problems in other areas of city finance, will have any serious impact on the water fund.

Senator BIBLE. Would you clarify that statement there, Mr. Auld? Is that because these are on a service basis?

Mr. AULD. Yes, sir; that is correct. The quantity of water that is sold is fairly stable—that is sold through meters. And while the general economic level of our individual inhabitants may change from time to time, their water requirements are substantially the same.

Senator BIBLE. Thank you.

Mr. AULD. Our expansion program has provided for the expected water demands of Arlington County, Va., and our production capacity could be sufficient to meet at least the early requirements of the proposed Fairfax County water system should the county choose to secure water from the Dalecarlia plant.

Senator BIBLE. Do you service Arlington County and Fairfax County?

Mr. AULD. Every drop of water consumed in Arlington County is produced at Dalecarlia. Also, we supply the entire requirements of Falls Church, and a substantial fringe outside of Falls Church in Fairfax County now, which is served through the Falls Church sys-

tem. That is estimated to have about 30,000 people. Arlington has 167,000. Almost 200,000 of Virginia population today are served by us.

Senator BIBLE. Arlington County is serviced in what manner? Do they have their own independent municipal water system and simply contract with you for the purchase of water?

Mr. AULD. We wholesale to those distribution systems, and they resell it to their customers.

Senator BIBLE. Thank you.

Mr. AULD. As a matter of broad principle, the Dalecarlia filtration plant should be considered as the nucleus of a regional supply.

The large investment already made should be exploited to its maximum potential. In this way, more water can be produced at less cost than in any comparable development possible to build under today's inflated conditions. The adequate use of this facility together with other plants already in service or proposed, can meet all of the immediately expected water requirements of the metropolitan area.

Ultimately, another major filtration plant probably should be constructed farther up the Potomac for the service of the upper areas of Maryland and Virginia which are now still primarily agricultural.

A word of caution is in order. One of this Joint Committee's staff reports indicates that the Washington Aqueduct facilities of the Corps of Engineers could be used as a part of the system of a metropolitan water authority. Any such proposal must take full cognizance of the equity of the people of the District of Columbia in all of the works of the Washington water system.

It is popularly supposed that because the Corps of Engineers has jurisdiction over the filter plants that these facilities were constructed with Federal funds. In fact, however, the water system is a municipal utility with all of the operating and construction costs, including those of the Corps of Engineers, being paid exclusively from the District of Columbia water fund.

Senator BIBLE. May I ask you a question there. Water that you supply to various Federal agencies is furnished free? Is that what you are saying?

Mr. AULD. From 1859 until 1948 all water consumed by the Federal establishment was free. Since that time, Congress saw fit to apply first a lump-sum payment of $1 million a year as a credit to the water fund. That was less than the cost of service. And in 1954, the United States began for the first time to pay rates comparable to those paid by other customers.

Senator BIBLE. Is that on a metering basis into the various agencies?

Mr. AULD. Almost entirely; yes.

Senator BIBLE. At the present time?

Mr. AULD. There are some 750 Federal accounts, and I would say over 700 are metered.

Senator BIBLE. There are over 750 Federal accounts and over 700 are metered?

Mr. AULD. Yes.

Senator BIBLE. Thank you.

Mr. AULD. Of the $88 million presently invested in the city water system, less than $10 million was derived from Federal sources and this is believed to have been more than offset over the period of 90

years during which there was no direct Federal payment for water used by Federal agencies in and surrounding the District of Columbia.

Of the approximate $33 million total investment in the Dalecarlia plant after completion of presently authorized additions, less than $3 million will have to come from Federal contributions.

A metropolitan authority for the distribution of water to the local users is unnecessary. Water distribution should be a local function. Except for a portion of northern Virginia, water distribution is not now a serious problem and it need not become one. It is difficult to believe that any form of overall authority having operating responsibilities within the States of Maryland and Virginia and the District of Columbia would ever be acceptable to the people.

In the matter of Potomac pollution, there is one transcendent problem—the assurance of river water quality suitable for use for public water supply purposes. All of the present political jurisdictions are now alert to this and are taking action to prevent pollution above the water intakes.

My concern is whether within the resources at their disposal it will be possible for the various jurisdictions to accommodate permanently the population growth to be expected and continued to prevent serious contamination of the river as it passes through the upper portion of the metropolitan area. I strongly indorse the proposal of Dr. Abel Wolman, under which the sewage from areas of upper Montgomery and Fairfax Counties would be conveyed for treatment to the district's sewage-treatment plant.

Here again, as at Dalecarlia, there is in being a substantial development which has great potential for service ot the metropolitan area. The difficulty presented is the great cost of the trunk sewers necessary to bring the sewage to this plant from the remote locations.

At least a partial solution of this lies in the pollution-control project proposed to the District by its Board of Engineers which was engaged to study the District's sewerage system.

Notwithstanding the great benefits to be expected from the operation of secondary treatment facilities now under construction at the Blue Plains plant, the basic form of the city's sewerage system will result in continuing limited pollution of the Potomac and Anacostia Rivers.

The control and reduction of this can be had only from costly construction While the ultimate solution is the elimination of the combined sewer system in the District, and this should be our permanent goal, early benefits can be had only through construction of a major system of sewage interceptors proposed as project C in the Board of Engineers' report.

Mr. Chairman, I would like to present for your record excerpts from that Board report if I may——

Senator BIBLE. Certainly.

Mr. AULD. Which gives some particulars as to the system which I spoke of.

Senator BIBLE. They may be inserted as a part of the record and appropriately marked to identify them at this point.

(The excerpts referred to are as follows:)

EXCERPTED SECTIONS
FROM

Report to

DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING

on

IMPROVEMENTS TO SEWERAGE SYSTEM

BOARD OF ENGINEERS

Samuel A. Greeley
Frank A. Marston
Gustav J. Requardt

February 28, 1957

INCLUDED:

LETTER OF TRANSMITTAL DATED FEBRUARY 28, 1957
CHAPTER A - GENERAL DATA
CHAPTER H - RELIEF PROJECTS FOR INTERCEPTING SEWERS
CHAPTER I - RELIEF PROJECTS FOR COMBINED AND SEPARATE SEWERS
CHAPTER M - CONCLUDING STATEMENTS

DEPARTMENT OF SANITARY ENGINEERING
DISTRICT OF COLUMBIA

25182 O—58——4

LETTER OF TRANSMITTAL

February 28, 1957

Board of Commissioners
of the District of Columbia
District Building
Washington 4, D. C.

Gentlemen:

The Board of Engineers, composed of Frank A. Marston, Chairman, Samuel A. Greeley, and Gustav J. Requardt, herewith presents its study and "Report on Improvements to Sewerage System" of the District of Columbia. For convenience, the report is summarized in this Letter of Transmittal.

Purpose of the Study. The Board was required to make an engineering and planning study for the general purpose of evaluating the potentialities and needs of the sewer system in relation to the functions which it should perform.

The Board was to analyze present facilities, and standards of design and construction, with particular regard to stream pollution, practicable changes in the combined system, flooding, and the sufficiency of the sewers.

Among other things, the Board was to recommend revisions of the general plan of the sewer system, replacements and modifications or reconstruction of specific structures; to predict needs of the sewer system to the year 2000 and prepare a master plan of construction and reconstruction projects; indicating a recommended sequence, and including estimates of cost.

Stormwater drainage in separate-system areas was excluded from the Board's study. The Board's study of the sewage treatment plant of the District was presented in its report of October 31, 1956.

Existing Sewer System. The central and older portions of the District of Columbia are sewered on the combined system, in which both the sewage and the surface or rainwater runoff are conveyed in one system of pipes. This area amounts to about 15,160 acres, or 39 percent, of the total land area of the District of nearly 39,000 acres. Combined sewers were economical when built, and many cities (Boston, Chicago, Louisville, New York, Philadelphia, and others) are thus sewered, and such sewers even now are being extended in some cases. Cities like Baltimore, New Orleans, and others have no combined sewers because their sewers were built at a later time when sewage treatment was required and when it was more economical to build a separate system of sewers to avoid treating a large volume of surface-water runoff.

The remainder of the District is sewered on the separate system, in which the sewage is carried away in a system of pipes separate from those carrying surface-water runoff. In both systems, the sewage and some runoff are discharged finally to the sewage treatment plant, while the surface-water runoff is discharged into nearby waterways. In the case of the combined system, however, the discharge or overflow to the waterways consists of mixed surface-water runoff and sewage.

Intercepting sewers, or "interceptors," have been built to collect the dry-weather flow of sewage and some surface-water runoff from the combined sewers, so as to prevent dry-weather flow from being discharged into the waterways. The dry-weather flow collected by the interceptors, together with some runoff from rains, is finally carried to the sewage treatment plant.

Maps showing the principal features of the existing sewer system, Figs. 1 and 2, are included in Chapter A of the report. Fig. 2 shows the limits of the combined sewer system. A map of the District of Columbia and the Washington Suburban Sanitary District, from which sewage is discharged to the sewage treatment plant at Blue Plains, is shown on Fig. 4, Chapter B.

Population Served. The population tributary to the sewer system of the District has increased rapidly during the past 20 years, and is expected to continue at a rapid increase for some time. Following is a summary of the population in the District and in Maryland estimated to be tributary to the sewer system of the District in various years:

Year	Tributary population
1950	894,000
1960	1,453,000
1980	1,791,000
2000	1,925,000

Data on population, past and estimated future, are given on Fig. 3, Chapter A.

Receiving Waterways. The largest of the waterways which receive sewage is the Potomac River, with a drainage area of 11,560 square miles at the District. This stream has an average daily discharge of 11,280 cfs. (cubic feet per second) and a maximum recorded discharge of 484,000 cfs. The lowest daily discharge of record is 448 cfs. Monthly mean flows below 2,000 cfs. have occurred during the six warmer months, and weekly averages below 1,000 cfs. have been recorded. The Potomac River is a tidal stream below Three Sisters Islands, near Key Bridge, with a mean tidal range of about 2.9 feet. Except during floods, the direction of the current off Hains Point is reversed during each tidal cycle, changing from downstream, through slack water, to upstream, and then back again. This results in an extremely long time of flow past the District. For instance, the time of flow from Key Bridge to the sewage treatment plant at Blue Plains, a distance less than 7 miles, is about 8 days when the flow in the river is 2,000 cfs., and about 16 days when the flow is 1,000 cfs. There is little or no tidal action upstream of Key Bridge.

The Anacostia River, which drains only 170 square miles, has an average daily discharge of about 115 cfs., with a minimum daily flow of about 6 cfs. It, also, is a tidal stream.

Rock Creek is an important stream, in that it traverses beautiful Rock Creek Park in the District. Its drainage area is about 78 square miles, and its average flow is only 55 cfs. The maximum recorded daily discharge is 7,220 cfs., and the minimum, 0.5 cfs. It is affected by tides only at its mouth.

Washington Channel is an important waterway from the standpoint of sewerage works, since it is used as the District's harbor, since it receives mixed sewage and stormwater overflow from several combined sewers, and since the only flow in it results from the action of the automatic regulating gates of the Tidal Basin. These gates cause a downstream flow out of the Tidal Basin and, therefore, through Washington Channel, on each receding tide.

Inadequacy of Existing Sewers. The present inadequacy of some of the existing trunk sewers is amply demonstrated by the flooding of streets and basements, by overflows to

waterways, and by the surcharging of sewers. Other existing trunk sewers will become inadequate before the year 2000. Many relief sewers and associated structures and equipment are urgently needed.

An illustration of the flooding of streets and basements is the situation at 5th and Ingraham Streets, N.W., where water has stood several feet above the curbs on many occasions. The District is already providing relief for this location.

Overflows into watercourses are illustrated at the terminal chamber of Piney Branch where mixed sewage and stormwater is discharged at intervals into Piney Branch and thence into Rock Creek.

Many instances of recorded surcharges of sewers resulting in surface flooding are shown on Plate 2 (in envelope at back of report).

The intercepting sewers are the most troublesome from the standpoint of inadequacy. Many of them are grossly overloaded, with the result that dry-weather overflows of sewage to the streams occur on many bright summer days, when the results of such overflows are easily seen and are particularly objectionable. Furthermore, the inadequacy of the interceptors causes frequent overflow of mixed sewage and stormwater from combined sewers to streams during rainstorms.

To indicate overflows to nearby streams, a number of automatic recording gages were installed at the Board's request and were operated for over a year. The records of these gages have been an essential part of the basic data used by the Board for the purposes of this report. At one of these gages, located at 22nd Street and Constitution Avenue, N.W., there were 65 dry-weather overflows into a sewer discharging to the Potomac River, averaging over 7 hours' duration each, in the 5 months of May through September, 1956.

Projects for Relief of Intercepting Sewers (Chapter H). From the beginning of the Board's study in 1954, its work was directed to the reaching of important decisions and recommendations under two parts having to do with the inadequacies of existing sewers. The first and perhaps more important of the two was related to intercepting sewers, and the second to trunk sewers. Complaints of citizens, newspaper articles, and statements of qualified spokesmen were to the unanimous effect that something should be done to prevent the continued pollution of the Potomac and Anacostia Rivers and especially the pollution of the waters of Rock Creek. Demands reached the ultimate that no sewage of a human or industrial nature be allowed to enter the waterways and that all sewage be conveyed to the treatment plant at Blue Plains and there be properly disposed of.

The Board, with the importance of this condition in mind, considered a number of alternate projects, selecting for detailed study the following three projects which appeared best to solve the problem under varying degrees of abatement of sewage pollution and discharge into the nearby waterways.

> Project A (Fig. 14): This project comprises the conversion of all existing combined sewer systems into separate systems by the building of complete new systems of sanitary sewers in the streets, avenues, and alleys of the older parts of the District of Columbia (over 15,000 acres) and connecting these new sewers to the existing intercepting sewers, and the building of new pumping stations, force mains, and relief intercepting sewers. This project is the one most likely to prevent overflows into nearby waterways. In addition to its high cost, $238,000,000 at present-day prices (Engineering News-Record index 700) (Table 25), this project would be the most painful to adopt, in that many miles of trenches and

tunnels in the heart of the District would impede foot and wheel traffic, there would be substantial loss of business to merchants while sewer construction is under way, and the resultant noise, dust, and mud would inconvenience citizens for many years in the future. This project is not recommended.

Project B (Fig. 15): This project comprises the conversion of a few small areas from combined to separate sewer systems, and the building of new pumping stations, force mains, and relief intercepting sewers to take sewage highly diluted with a much larger quantity than at present of stormwater from the remaining combined sewer areas. The discharge to the streams of smaller quantities of diluted sewage would be farther downstream than at present. This project is estimated to cost somewhat over $93,000,000. Its adoption would cause much less pain and inconvenience than would Project A. It is not recommended by the Board.

Project C (Fig. 16 and Plate 1): This project comprises the conversion of the Project B areas and in addition the conversion of a large area up river of Key Bridge from combined to separate sewer systems, and the building of new pumping stations, force mains, and relief intercepting sewers to take sewage diluted with a larger quantity of stormwater from the remaining combined areas than at present (but at a lesser dilution than under Project B). The discharge to the streams of smaller quantities of diluted sewage would be farther downstream than at present (but not as small as under Project B). Project C is estimated to cost almost $72,000,000 and its pain and inconvenience of construction is comparable to that of Project B. This is the project recommended by the Board.

Project A would not fully produce the results hoped for. While it would prevent sewage pollution from entering the rivers from the areas in the District of Columbia, the receiving waters would already have been discolored by soil erosion upstream. From a visual standpoint, therefore (except in the very low river flows), the beneficial effect of Project A would be slight. From a pollution-abatement standpoint, Project A would give better results than Projects B and C only at times of wet weather. Project A would not prevent street wash and other pollution from being discharged to the waterways through stormwater sewers. The excessive cost, the length of time for the completion of construction, up to 20 years, and the tremendous inconvenience and pain to citizens and the traveling public are other reasons why Project A, in the Board's opinion, should not be adopted.

Project C provides more abatement of pollution in the upper Potomac River above Rock Creek than does Project B. Project C equals A in this respect. It is the upper Potomac where water sensibly free of sewage pollution should be provided, because it is here that the best opportunity for all sorts of water sports will be found. Both B and C would prevent the overflow of sewage during dry weather, a condition which now occurs much of the time. In this respect, they are of equal value at such times to Project A in the abatement of pollution of the waterways. Project C is less expensive and, in the Board's opinion, more realistic than B. The Board, therefore, for the relief of intercepting sewers, now and in the future, recommends the adoption of Project C.

Intercepting Sewer Relief in Rock Creek Park. From the Piney Branch area there are overflows of mixed sewage and stormwater into Rock Creek up to 4 times a year, on the average. Similar overflows into Rock Creek from several smaller areas also occur. To prevent these overflows from mixing into the natural waters of the Creek and to supplement the proposed relief interceptors, the Board has proposed a conduit under and near the

bed of Rock Creek from the mouth of Piney Branch to the Potomac River, a distance of 18,500 ft. To carry overflows from storms likely to occur up to once every 2 years, on the average, such a conduit, including an enclosed conduit along Piney Branch 2,600 ft. long, is estimated to cost $14,000,000. This amount has been included in the estimates of costs of both Projects B and C. If it were deemed advisable to provide for the prevention of overflows into Rock Creek from storms which may occur once every 5 years, the cost of the larger conduit along Rock Creek and Piney Branch is estimated to be $18,500,000.

Projects for Relief of Trunk Sewers. For the relief of flooding in many locations of the District (Plate 2) the Board proposes various construction projects which are summarized as follows (Chapter I and Plates 2 and 3):

Reliefs for Combined Trunk Sewers (Table 27)

B Street-New Jersey Avenue	$13,470,000	
Easby Point	4,860,000	
Northeast Boundary	15,780,000	
Northwest Boundary	2,880,000	
Piney Branch and Spring Road	2,150,000	
Slash Run	2,200,000	
Tiber Creek	15,850,000	
		$57,190,000

Reliefs for Separate Trunk Sewers (Table 28)

Anacostia Main Interceptor District	$ 1,130,000	
Broad Branch Road	280,000	
Falls Branch	710,000	
Luzon Valley	310,000	
Oxon Run	1,810,000	
		$ 4,240,000
Total estimated costs, reliefs for trunk sewers		$61,430,000

The requirements for the above reliefs are substantially the same in Projects A, B, and C.

Recommended Total Construction Program and Summary of Total Construction Costs. A summary of the cost of the proposed construction program for the relief against the flooding of intercepting and trunk sewers and for the reasonable abatement of pollution of the waters of the Potomac and Anacostia Rivers and of Rock Creek is as follows (Table 29):

Relief projects for intercepting sewer systems	$60,460,000	
Conversion of combined sewer systems to separate sewer systems	11,284,000	
Total of Project C		$ 71,744,000
Relief projects for combined and separate trunk sewers		61,430,000
Cost of total construction program		$133,174,000

If it were decided to provide the utmost in preventing raw sewage emanating in the District of Columbia from entering the nearby waterways, as by Project A, then the total construction cost would be about $300,000,000. Likewise, if Project B were adopted, the total construction cost would be about $155,000,000.

Following is a summary of the above total construction costs for the alternate projects, in round numbers:

For Project A	$300,000,000
For Project B	155,000,000
For Project C	133,000,000

Cost Estimates, Unit Costs, and Sewage Flow Requirements. It is stated in several places in the report, and readers of this letter of transmittal are reminded, that all cost estimates in the report are based on prices for labor, materials, and equipment which prevailed in the last few months of 1956, averaged to an index of 700 (Engineering News-Record Magazine). The total costs of the various sewer and relief projects include a further allowance of 15 percent to cover contingencies and an allowance of 10 percent for engineering and administration.

Construction costs have been rising at a steady rate during recent years, and, since 1950, to the extent of about 4.8 percent per year. The Engineering News-Record Construction Cost Index for February 1957 was 710.1, and it was still going up. If an average increase per year of 4.8 percent were to continue, by 1980 the construction cost index would be considerably more than double the 700 basis used for the construction cost estimates given in this report.

Advance in costs must be taken into consideration when determining budgets for the future.

In Appendix 1 are given data on unit costs of pipe and concrete sewers in dry and wet trenches and in tunnel, and unit costs of pumping stations. These costs do not carry allowances for contingencies, engineering and administration.

Information and data upon the estimated cost of conversion from combined systems to separate systems are given in Appendix 2.

Inadequacies of sewers have been checked on present-day sewage flows, and also on the basis of estimated flows for the year 2000. Recommended reliefs have been estimated on capacity requirements which are likely to prevail in the year 2000.

Schedule of Recommended Construction Program. Chapter J discusses a construction program in considerable detail. Table 34 gives a summary which in round figures is as follows:

Period, years	Estimated cost
1958 - 1960	$ 10,000,000
1961 - 1963	41,000,000
1964 - 1966	38,000,000
1967 - 1969	25,000,000
1970 - 1972	19,000,000
Total	$ 133,000,000

It is to be remembered that the relief construction programs set forth and recommended in this report do not include the normal programs of the Department of Sanitary Engineering for the yearly building of lateral sewers, storm drains, etc., necessary for the expansion of sewerage as the District grows, and for correction of drainage deficiencies in separate-system areas.

Other Matters Studied. The Board has worked up and has adopted basic data on the design of separate and combined sewers, such as per-capita daily sewage flows, rate of rainfall of storms of 15-year frequency, distribution of rainfall intensity, stormwater allowance in design of separate sewers, ratio of peak sewage flow to average flow, etc. Discussion of these data will be found in Chapter E.

Stream pollution problems are discussed in Chapter F. In the Board's study of these problems, certain fundamental considerations were stated as follows:

(a) Receiving waterways

The characteristics and uses of the receiving waterways constitute a fundamental consideration of first importance.

(b) Number or frequency of overflows

A good yardstick of the relation between the capacity of an intercepting sewer and the characteristics of the receiving waterway is the frequency of permissible overflows in a given period.

(c) Duration of overflows

The length of time during which an overflow continues is an important yardstick.

(d) Quantity overflowed

The quantity of combined sewage overflowed into receiving waterways is also a helpful yardstick.

(e) Degree of pollution

The effect of the overflow of sewage from combined sewers as to the resulting concentration of pollution is an important matter.

(f) Relative costs

As the frequency of overflows decreases and the duration and quantity overflowed become less, the cost of the intercepting sewers increases considerably. This relative cost is an important and realistic index of what should be expended for the abatement of pollution.

A careful study of the records of gages maintained by the District resulted in some useful units for these yardsticks.

The Board reviewed current planning and design standards and engineering and construction practices in the District regarding sewer construction. In Chapter K will be found the Board's review of various details of sewer construction such as pipe materials, foundations, manholes, junction chambers, etc., also a review of contract specifications now used by the District.

Members of the Board and its staff visited the pumping stations and the storage and repair yards on 1st Street, S.E., inspected the outlets of many sewers, held conferences with the heads of the Sewer Operations Division and its several branches, and read annual reports having to do with sewer maintenance and operation, sewage pumping, and related matters. The resulting findings of the Board are embodied in Chapter L. The principal recommendation of the Board in that chapter is that the duty of cleaning the some 21,000 catchbasins of the District be assigned to the Division of Sewer Operations and removed from the Division of Sanitation where this cleaning duty now rests.

Concluding Statement. Beginning in the summer of 1954, the Board has been continuously engaged for over two and one-half years in answering the fundamental proposition: ". . . . an engineering and planning study for the general purpose of evaluating the potentialities and needs of the (sewer) system (of the District) in relation to the functions which it should perform." To render this engineering service, including a study and report on the sewage treatment plant of the District, the Board has maintained a full-time engineering staff in the District, has held over 60 full-day meetings at its headquarters, 301 Bryant Street, N.W. (waterworks pumping station), and has corresponded by mail voluminously among the home cities of its members: Boston, Chicago, and Baltimore. Design studies have been made of structures in a preliminary way to a total estimated cost approaching half a billion dollars. The sewer construction program for relief from flooding and for abatement of pollution in nearby waterways to a total of $133,000,000, based on present-day prices, has been recommended. A practicable construction program is recommended to extend over a 15-year period.

As stated above, the Board favors Project C as being realistic in its balance between the degree of pollution abatement and the first cost. Project C would give relatively prompt relief from pollution and would cause far less inconvenience to the people of the District. The Board does not feel that the long period of disturbances required for the construction of Project A needs to be suffered, and, on the other hand, concludes that fully adequate relief from pollution would be provided by Project C.

The execution of the recommended program should give the District a very clean Potomac River upstream of Georgetown and a very clean Rock Creek, provided undue pollution does not come from sources other than the District. The Potomac River downstream of Georgetown, and the Anacostia River, should become reasonably clean. By "clean" is meant freedom from pollution by sewage and industrial wastes. Discoloration from soil erosion would still be present.

We wish to thank you and the Department of Sanitary Engineering for your assistance and cooperation and for the opportunity of studying a problem of such interest and magnitude.

Respectfully submitted,

BOARD OF ENGINEERS

Frank A. Marston, Chairman

Samuel A. Greeley

Gustav J. Requardt

REPORT

CHAPTER A

GENERAL DATA

1. General Statement

The District of Columbia, herein referred to as the "District," by Agreement DCF-A-752, dated June 29, 1954, established a Board of Engineers, herein referred to as the "Board," for the general purpose of evaluating the potentialities and needs of the sewer system of the District in relation to the functions which it should perform. The Board consists of Frank A. Marston, Chairman, of Boston, Samuel A. Greeley of Chicago, and Gustav J. Requardt of Baltimore.

Concurrently with the work of this Board, the District engaged the services of Metcalf & Eddy, Engineers, of Boston, to make an investigation of the sewerage system of the District and to report thereon as to the details of the system, the condition of the principal sewers, and the actual and required capacities of the trunk lines. The Metcalf & Eddy investigative report[1] was issued as of June 1955. The investigation did not include storm-water drainage in separate-system areas nor did it include the sewage treatment plant, the Anacostia Main Interceptor, and the Watts Branch Drainage Area.

The District engaged the services of Whitman, Requardt and Associates to study and report upon the two sewer projects excluded from the Metcalf & Eddy investigation. The two reports of Whitman, Requardt and Associates were issued as of July 11, 1955 and November 30, 1955.

On November 25, 1955, the District, by Supplement No. 1 to Agreement DCF-A-752, added to the work of the Board a review and report on the various units of the sewage treatment plant. The Board's report was issued under date of October 31, 1956, and was entitled, "Report on Sewage Treatment Plant."

The Board appointed as its Engineer-Director, C. Frank Johnson of Metcalf & Eddy, who has been in charge of the detailed work of the Board and Director of its office in Washington. Suitable office space and equipment were provided by the District at the Bryant Street Water Pumping Station. The Board has met in Washington, D. C., about once a month.

The Board has received the full cooperation of the Department of Sanitary Engineering, has been supplied with District records of construction and operation of the sewerage system, has made use of pertinent data in Federal files, and has had the benefit of the report of Metcalf & Eddy on the "Investigation of Sewerage System," of the studies and reports of Whitman, Requardt and Associates, on the "Anacostia Main Interceptor" and the "Watts Branch Drainage Area," and has undertaken additional studies as deemed necessary.

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1. Entitled, "Report upon Investigation of Sewerage System."

The Board has reviewed previous comprehensive reports on the sewerage system, including the following:

Hering, Gray, Stearns, 1890
D. E. Macomb, 1898
Robert B. Morse, 1914
J. B. Gordon, 1929
Eddy, Gregory and Greeley, 1933
Sherman and Horner, 1935
Interstate Commission on the Potomac River Basin, 1954

A review of these reports and papers is given in Chapters 3 and 4 of the Metcalf & Eddy investigative report of June 1955. In addition, the Board has reviewed the paper by Niles and Klegerman on "Stream Pollution" as referring to the Potomac River and read at the Atlanta meeting of the American Society of Civil Engineers, February 17, 1954.

On July 13, 1954, the Board furnished a statement of intended scope of the work being undertaken by the Board. This covered and included the requirements embodied in the contract (Article II, Section 1).

The results of the work of the Board are given in this report, together with appendixes, associated data, computations, maps, plans, and profiles.

2. Existing Sewer System

Historical. Prior to 1871, drainage of the central part of the District was accomplished through the Washington City Canal, completed in 1815 through the tidal flats and marshes, from the Potomac River near the foot of 17th Street, S. W., along present-day Constitution Avenue, thence through Canal Street to the Anacostia River at the foot of New Jersey Avenue, S.E. During and after the Civil War this Canal was the source of much objection because of odors and poor drainage. It was filled in by the Board of Public Works in 1872, at which time it was replaced as a sewerage facility by the "Old B Street Sewer," discharging to the river just west of 17th Street.

In 1859 the Potomac public water supply was introduced and the need for adequate sewers increased rapidly. In 1874 there were about 80 miles of sewers. Drainage of sewage and storm-water was through the principal watercourses discharging into the Potomac River, including the former Washington City Canal which had then been converted to the "Old B Street Sewer." The construction of a comprehensive system of sewers began a few years after the recommendations of the Hering-Gray-Stearns Report of 1890.

Types of Sewers and Sewer Systems. The central and older portions of the District are sewered on the combined system, in which both the sewage and the surface-water runoff are conveyed in one system of pipes. This area amounts to about 15,160 acres, or 39 percent, of the total land area of the District of nearly 39,000 acres (exclusive of islands). The remainder of the District is sewered on the separate system, in which the sewage is carried away in a system of pipes separate from those carrying surface-water runoff. In both systems, the sewage is discharged finally to the sewage treatment plant, while the surface water is discharged into nearby watercourses. In the case of the combined system, the discharge to the watercourses consists of mixed sewage and surface-water runoff.

Combined sewers were economical when built, and many cities (Boston, Chicago, Louisville, New York, Philadelphia, and others) are thus sewered, and such sewers even now are being extended in some cases. Cities like Baltimore, New Orleans, and others have no combined sewers because their sewers were built at a later time when sewage

treatment was required and when it was more economical to build a separate system of sewers to avoid treating a large volume of surface water runoff.

Intercepting sewers, or "interceptors," have been built in the District to collect the dry-weather flow of sewage and some surface-water runoff from the combined sewers so as to prevent dry-weather flow from being discharged into the watercourses. The dry-weather flow collected by the interceptors, together with some runoff from rains, is finally carried to the sewage treatment plant.

In Rock Creek Valley, below Piney Branch, there are two large sewers called "diversion sewers," one on the easterly side of Rock Creek and the other on the westerly side, which receive the dry-weather flow and large volumes of stormwater from local combined sewers and which carry the mixture of sewage and stormwater to the Potomac River during periods of heavy rainfall. These diversion sewers reduce the frequency and volume of sewage being discharged into Piney Branch and Rock Creek during rainstorms.

Substantially all of the sewers in the Washington Suburban Sanitary District (W.S.S.D.) discharge into the sewerage system of the District of Columbia. All sewers in the W.S.S.D. are designed on the separate plan.

General Plan of Sewerage. The existing system of sewerage in the District is indicated on Fig. 1, which shows the principal combined and separate sewers, the intercepting and diversion sewers, and the outfall sewers. These sewers are described in detail in Chapter 5 of the investigative report of June 1955.

Sewer Districts. For convenience in studying the sewerage system, the District has been divided into some 93 sewer drainage districts, as shown on Fig. 2, arranged in 11 groups under the names of the principal sewers to which the areas are tributary. A tabulation of these districts with statistics of each will be found in Table 1, Chapter 6, of the investigative report of June 1955. Further details are given in that chapter in the discussion of each group.

A summary of the data for these sewer districts follows:

Item	Quantity or unit
Area, for entire District, in acres	
Total	38,859
Net or sewage producing[1]	29,375
Population, year 1950	
Total	802,178
Per net acre	27.3
Population, year 2000	
Estimated total	1,125,000
Per net acre	38.3

The areas given above do not include the Potomac and Anacostia Rivers and their various channels and islands, or Washington Channel and the Tidal Basin. East Potomac Park and the portion of West Potomac Park southeast of the Tidal Basin are excluded.

1. Excludes parks, playgrounds, cemeteries, railroad yards, waterworks reservoirs, and airports.

3. Industries

The District was designed as the location of the Federal Government. Many large governmental buildings have been erected in the District and in the surrounding areas in Maryland and in Virginia. Employment by governmental agencies furnishes the principal occupation for the residents of the Washington metropolitan area.

Industrial establishments have not been attracted to this area, and except for some service and building industries, they are few in number and small in size. Recent attempts have been made to interest nuisance-free industries in locating in some of the fringe sections of the metropolitan area.

Industrial wastes constitute only a small portion of the sewage to be collected and treated, and the wastes that are present come principally from food-processing and other service establishments and from building industries.

The "Report on Water Pollution in the Washington Metropolitan Area, Section II - Technical Report," February 1954,[1] page 15, in discussing "Industrial Wastes," refers to washwater from three transit-mix concrete companies, washing from three sand and gravel plants, waste water from an asphalt road surfacing material plant, and drainage from several stockpiles of coal, as being causes of discoloration of the water in the Anacostia and Potomac Rivers. The above report refers, also, to the discharge of "tank sludge and highly alkaline boiler backwash water," a condition noted by the Board during some of the observation trips along Rock Creek.

It is said, in the report, that blood and wastes from slaughterhouses are discharged during periods of rainfall, along with sanitary sewage, directly into Washington Channel. Other wastes from small oil-reclaiming plants, gas plants, printing plants, and other similar types of operations are discharged to the surface waters in Maryland and Virginia.

4. Areas

The District was originally 10 mi. (miles) square, but now is that part of the original 10-mi. square lying easterly of the Potomac River. The southeastern part of the District is divided by the Anacostia River, which flows through the District in a southwesterly direction into the Potomac River. The District has an area, excluding the waterways and islands, of about 39,000 acres, or nearly 61 sq. mi. (square miles).

The District is the center of a metropolitan area which includes parts of Maryland and extends across the Potomac River into Virginia.

In Montgomery and Prince Georges Counties, Maryland, which adjoin the District, there are a number of communities which are combined in the W.S.S.D. for water and sewerage services.

The business of most of the residents and other workers in the District is essentially governmental, that of the United States of America and of the District itself. There are no large industries within its borders. There are many large Government buildings covering extensive areas and requiring heavy concentrations of employees. There are a number of important art galleries, museums, and libraries. Considerable areas of the District are occupied by parks, recreational areas, institutional grounds, and cemeteries. The District contains the headquarters of many national organizations such as religious societies, trade unions, and fraternal organizations.

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1. Report of the Interstate Commission on the Potomac River Basin.

All of this development has a marked effect on the requirements of systems for the collection and disposal of the sewage and for the drainage of stormwater. There are only small quantities of industrial wastes. The collection and disposal of domestic sewage is of great importance.

5. Population

The District and its environs have had a phenomenal growth in population since 1930. The area of the District is established by law, and it is foreseeable that a time will come when the point of saturation of population and surface occupancy will be reached within that area. In Montgomery and Prince Georges Counties, Maryland, however, as well as across the Potomac River in Virginia, there is room for expansion and areas are available to accommodate large increases in population. It has been demonstrated that wars and other conditions affecting the national economy have had a strong influence on the growth of population of the District and adjacent areas. Expansion of Federal activities results in greater opportunities for employment and attracts many persons to this area. Offsetting such rapid growth there is an increased trend toward living in the suburbs and commuting to work. Some Government agencies have moved away from the District.

District of Columbia. The population of the District from 1900 to 1956, together with the estimated population from 1960 to the year 2000 are given in Table 1. These data, together with the census figures for the years 1800 to 1890, are shown by diagram on Fig. 3. The estimates for 1960 and beyond have been based on a decreased rate of growth for the reasons cited above.

Montgomery and Prince Georges Counties, Maryland. Data shown on Fig. 3 indicate graphically the very rapid growth of these two counties adjacent to the District, particularly since 1940. It is estimated that the total population of the two counties will be 1,050,000 by the year 2000, or nearly as great as that for the District at the same time.

The population of these counties in Maryland is of direct effect on the sewerage problems of the District, since most of the sewage from the developed areas in these counties will be tributary to the District system. The District has an agreement with the Washington Suburban Sanitary Commission (W.S.S.C.), which serves a large part of these county areas, to receive the sewage flows at the District boundary and convey them to the District Sewage Treatment Plant for disposal. The sewerage system of the District must be adequate in capacity to handle the sewage flows from the W.S.S.D. The future population of the W.S.S.D., as estimated by the Board, is shown on Fig. 3 as 800,000 in the year 2000.

Population Estimated for Year 2000. A summary of the population estimated to be tributary to the sewage treatment plant of the District for the year 2000 follows:

District of Columbia	1,125,000
Maryland areas in Washington Suburban Sanitary District tributary to District system	800,000
Total	1,925,000

For comparison with the Board's estimate, above, for tributary Maryland areas, Mr. Harry B. Shaw, Chief Engineer of the W.S.S.D., has estimated the tributary Maryland population at 708,000 as of the year 1980 (Table 5, Chapter B).

Table 1. Population of District of Columbia[1]

Year	Population	10-year increase	
		Population	Percent
(1)	(2)	(3)	(4)
1900[2]	278,718[3]	--	--
1910	331,069	52,351	18.8
1920	437,571	106,502	32.2
1930	486,869	49,298	11.3
1940	663,091	176,222	36.2
1950	802,178[3]	139,087	21.0
1951	819,000[4]	--	--
1952	828,000[4]	--	--
1953	846,000[4]	--	--
1954	849,000[4]	--	--
1955	853,000[4]	--	--
1956	866,000[5]	--	--
1960	920,000[6]	117,822	14.7
1970	1,010,000[6]	90,000	9.8
1980	1,070,000[6]	60,000	5.9
1990	1,110,000[6]	40,000	3.7
2000	1,125,000[6]	15,000	1.4

1. See Table 5 in investigative report of June 1955. Certain minor revisions and additions have been made.
2. See Fig. 3 for population prior to 1900.
3. Population from 1900 to 1950 according to U. S. Census.
4. As revised by U. S. Census Bureau to replace estimated value originally published. Estimated as of July 1 of each year.
5. Estimated by U. S. Census Bureau, as of July 1.
6. Estimated by Board for use in connection with sewer design studies. Compare with other predicted population figures given in Table B-4 of investigative report of June 1955.

Population Used for Sewer Design Computations. The estimated population of the District for the year 2000 was determined for each sewer district and subdistrict by first allocating and prorating the population recorded by census tracts and enumeration districts in 1950, by taking into consideration other available data and trends in population growth, and by extending the detailed figures to correspond with the over-all estimates for the future. Further details are given in the investigative report of June 1955. The estimated population of the District in the year 2000 is shown in Table 1 to be 1,125,000, which has been used as a basis for sewer design. According to the U. S. Census Bureau, the District had a population, as of July 1, 1955, of 853,000. With this and the above estimate of 1,125,000 for the year 2000, it can be estimated that the population of the District in the year 1980 may be 1,070,000, for sewage treatment plant design.

The estimated population in Maryland areas tributary to the District sewer system in the year 2000 has been given herein as 800,000. For sewage treatment plant design as of the year 1980, the tributary Maryland population was estimated by the Board at 721,000.

Thus, the total estimated population in 1980 for sewage treatment plant design is as follows:

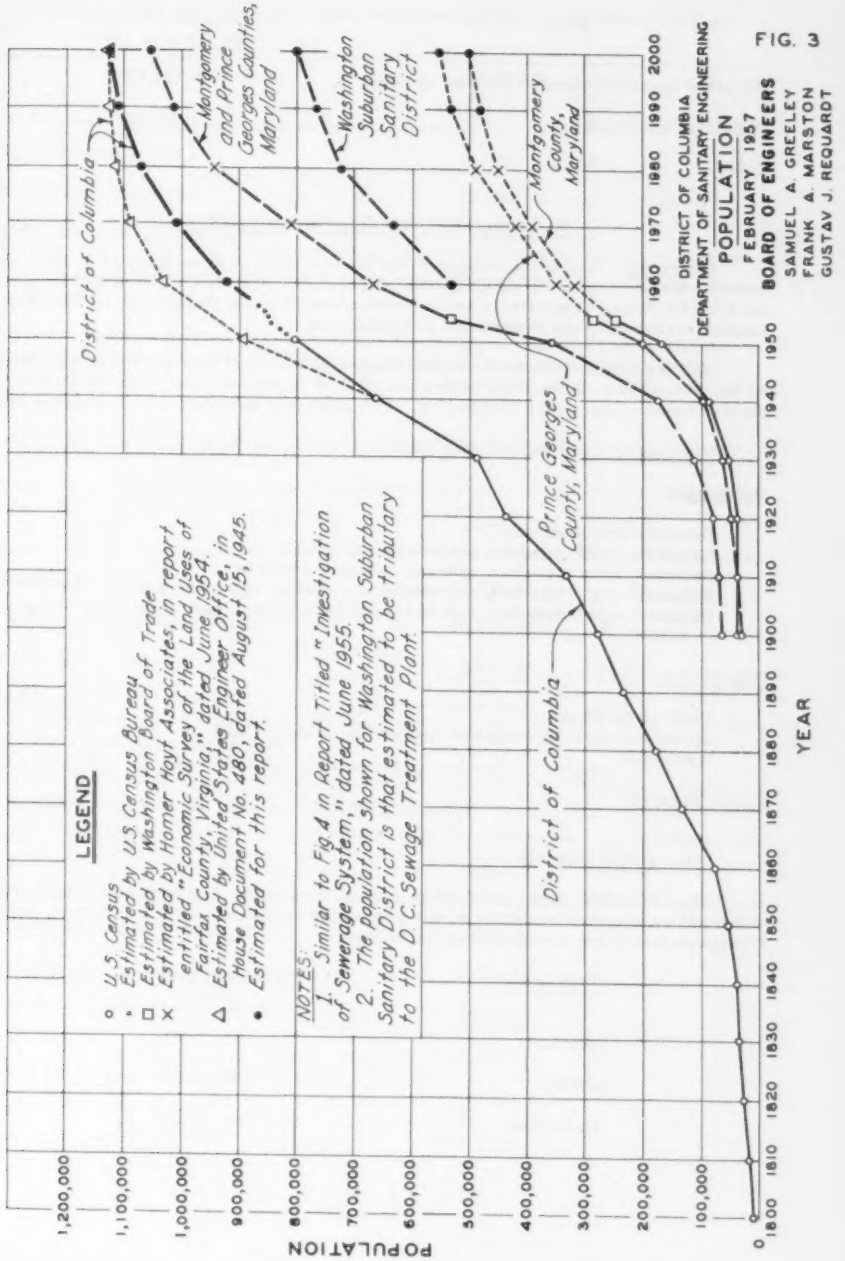
LEGEND
○ U.S. Census
• Estimated by U.S. Census Bureau
□ Estimated by Washington Board of Trade
× Estimated by Homer Hoyt Associates, in report entitled "Economic Survey of the Land Uses of Fairfax County, Virginia," dated June 1954
△ Estimated by United States Engineer Office, in House Document No. 480, dated August 15, 1945.
● Estimated for this report.
NOTES:
1. Similar to Fig 4 in Report Titled "Investigation of Sewerage System," dated June 1955
2. The population shown for Washington Suburban Sanitary District is that estimated to be tributary to the D.C. Sewage Treatment Plant.
District of Columbia
Montgomery and Prince Georges Counties, Maryland
Washington Suburban Sanitary District
Montgomery County, Maryland
Prince Georges County, Maryland
District of Columbia
POPULATION
YEAR
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1800 1810 1820 1830 1840 1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000
DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING
POPULATION
FEBRUARY 1957
BOARD OF ENGINEERS
SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT

FIG. 3

Area	Population estimated for the year 1980
Maryland areas tributary to District system	721,000
District of Columbia	1,070,000
Total	1,791,000

6. Zoning and Large Government Buildings

Historical. Zoning regulations of the District were first established in 1920, after an enabling act was passed by the Congress in that year. The regulations are established by the District Zoning Commission and are administered by the Department of Licenses and Inspection (formerly the Department of Inspections).

The regulations have been revised several times since they were originally established. At the present time a comprehensive study is in progress, with the object of making a complete revision of the zoning regulations. This project is expected to be completed in 1957.

Classifications. The following classifications are in use:

Residential

Detached dwellings only
Detached, semi-detached, and community houses
Detached, semi-detached, row and community houses
Detached, semi-detached, and community houses, apartment houses, and flats
Detached, semi-detached, row and community houses, apartment houses, flats, and hotels

Commercial

First commercial
Second commercial (might be termed "light industrial")
Industrial

Public Property

Parks
Other public property

The residential areas are further classified as to the maximum percentage of the lot which can be occupied by buildings, the percentage varying for interior, corner, and triangular lots in the various areas, as follows:

Type of lot	Occupancy permitted, percent
Interior	40 - 90
Corner	50 - 100
Triangular	60 - 100

Minimum lot sizes for residential areas were first adopted in December 1955, as follows:

Type of dwelling	Minimum lot size	
	Area, sq. ft.	Width, ft.
One family, detached	5,000	50
One family, semi-detached	2,500	25
One family, attached (row houses)	2,000	20

Certain exceptions to the minimum sizes of lots were permitted for nonconforming lots then existing.

Present regulations permit a maximum building height of only 40 ft. (feet) (three stories) in most areas. The maximum height permitted in any area (downtown) is 140 ft. (14 stories), of which only 110 ft. can be straight up. Certain setbacks are required above a 110-ft. height.

Summary of Areas by Classification. In February 1955, the Zoning Commission published the following data based on its records:

Classification	Area, acres	Percent of total land area
Total zoned area	17,934.76	45.7
Area owned by Federal Government[1]	12,713.68	32.5
Streets and alleys[2]	8,545.16	21.8
Total land area	39,193.60	100.0

1. Exclusive of Federal public housing.
2. Does not include all streets through area owned by Federal Government.

The zoned area was reported to be divided as follows:

Classification	Area, acres	Percent of total land area
Home areas, other than apartments	7,565.55	19.3
Apartments	7,068.36	18.0
Business and industry	3,300.85	8.4
Total	17,934.76	45.7

The zoned areas were reported to be further subdivided as follows:

Classification	Area, acres	Percent of total land area
Home areas		
Residential "A" restricted	5,902.19	15.1
Residential "A" semi-restricted	1,061.94	2.7
Residential "B" restricted	601.42	1.5
Total	7,565.55	19.3
Apartments		
Low density (residential "A")	3,246.30	8.3
Medium density (residential "B")	2,725.23	6.9
High density (residential "C")	1,044.51	2.7
High density (residential "D")	52.32	0.1
Total	7,068.36	18.0
Business and Industry		
Retail business (first commercial)	1,448.27	3.7
Light industry (second commercial)	938.46	2.4
Heavy industry (industrial)	914.12	2.3
Total	3,300.85	8.4

Large Government Buildings. There are a number of areas in the District occupied by extensive buildings housing Federal Government and District Government departments, particularly in the triangle between Pennsylvania and Constitution Avenues, easterly of The Ellipse. There are also the building groups between Constitution Avenue and Lincoln Memorial Reflecting Pool, the Department of Agriculture and Bureau of Engraving and Printing in the vicinity of 14th Street and Independence Avenue, S.W., the Department of Interior at Virginia Avenue and 19th Street, N.W., and other more scattered groups. These buildings concentrate large populations in relatively small areas during working hours. It is now general practice in designing the service piping for these buildings to separate the roof and area drainage from the sanitary sewage, and to carry the main building connections separately out to the street sewer, or in some cases, to a point outside the building wall, even though both services may discharge into the same combined sewer. This would facilitate the separation of surface water from sewage if such areas were to be changed from the combined system of sewers to the separate system.

7. Pertinent Ordinances and Regulations

There are a few regulations which have a direct bearing on the volume of sewage to be collected by the separate-system sewers in the District and in the W.S.S.D.

District of Columbia. Section 602 of Part VI of "The Plumbing Code of the District of Columbia" states in part:

> Roof leaders and surface and ground water drains shall not be connected to house sewers which discharge into public sewers intended for the carriage of sewage only, except when special application made in advance is approved by the Engineer Commissioner; subsurface drains for ground water only, built around or immediately adjacent to building foundations walls, may be connected direct to such public sewer, or to the house connection at such point, and in such manner as the Engineer Commissioner may designate, provided that this privilege will not be granted unless the owner signs a written agreement to disconnect such subsurface drain when directed so to do by the Commissioners of the District of Columbia.

The agreement signed by a property owner for installation of a drain from the front, rear, or side area of a building and for connection of the same to the house sewer which discharges into a separate-system public sewer intended for the carriage of sewage only, states in part that:

> . . .said area shall not exceed in aggregate twenty (20)[1] square feet in area, and that the walls thereof shall be raised above grade with a protecting coping, and that no roof leaders, surface or ground water drains shall be located so as to discharge any of their water therein, nor shall any walk way be graded thereto, to the end that no roof, surface, or ground water shall enter the said drain. . . .

A similar provision is made in the case of an area drain in the District to be connected to the house sewer which discharges into a separate-system public sewer intended for the carriage of sewage only, which public sewer drains into the sewer system of the W.S.S.C.

The agreement signed by a property owner for installation of a drain from a front, rear, or side area at a building and for connection of the same, by an independent lateral, to the separate-system public sewer intended for the carriage of sewage only, states in part that:

> . . .the said area shall not exceed in aggregate fifty (50) square feet in area, and that the walls thereof shall be raised above grade with a protecting coping, and that no roof leaders, surface or ground water drains shall be located so as to discharge any of their water therein, nor shall any walk way be graded thereto, to the end that no roof, surface, or ground water shall enter the said drain or the said area. . . .

The agreement signed by a property owner for installation of a drain in a depressed driveway to a garage and connection of the same, by an independent lateral, to the separate-system public sewer intended for the carriage of sewage only, states in part that:

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1. It is proposed by District officials to change this to read "thirty (30) square feet."

> . . .the said depressed driveway. . .shall not exceed in aggregate one hundred eighty (180) square feet in area, and that the side walls thereof shall be raised above grade with a projecting coping, and that no roof leaders, surface, or ground water drains shall be located so as to discharge any of their water therein, to the end that no roof, surface, or ground water shall enter the said depressed driveway. . . . .

There is a provision of the Plumbing Code, Section 608, Part VI, of the District, that buildings and appurtenant paved surfaces having an area of more than 7,600 sq. ft. (square feet) shall be provided with separate sanitary and stormwater systems throughout the building and extending to the public sewer. It is proposed by the Department of Sanitary Engineering to recommend change of this requirement to embrace all new buildings regardless of size.

In the District it is required that if a property owner has installed a connection draining 20 sq. ft. of areaway into a sanitary sewer and subsequently elects to install a second or stormwater connection to a stormwater sewer, the said 20 sq. ft. shall be reconnected so as to drain through the stormwater connection. A similar provision applies to cases where 50 sq. ft. of areaway and/or 180 sq. ft. of depressed driveway area have been permitted to connect to a sanitary sewer through a second connection other than the house sewer, and subsequently a stormwater sewer is constructed to which all of the stormwater can be drained. The Department of Sanitary Engineering is considering a recommendation that would prohibit the draining of large areaways and depressed driveways to separate system sanitary sewers, either or both of which are now permitted to enter such sewers through a second connection. Included also would be an increase from 20 sq. ft. to 30 sq. ft. in the size of areaway permitted to be connected to the sanitary house connection.

Washington Suburban Sanitary Commission. Section 608.1 of the Plumbing Code of the Washington Suburban Sanitary Commission states as follows:

> 608.1. No rain water leaders or other pipes carrying roof, surface or ground water shall be connected to pipes conveying sewage. However, cellar drains in cellars ordinarily dry or not subject to flooding may be connected to the building drain unless expressly disapproved, and paved areas containing not over 30 square feet of horizontal surface entirely unprotected by roof, and not receiving drainage from other surfaces, may be drained to the building sewer or building drain.

8. Topography

The land surface in the District varies in elevation from the low areas adjacent to Potomac River, in East and West Potomac Park, along Washington Channel, and along the shore lines of Anacostia River at about El. (Elevation) 10 to El. 410 near the junction of Wisconsin and Nebraska Avenues, N.W. The lowest established street grade is El. 6.0, at 15th Street and Constitution Avenue, N.W., and the highest, El. 410.0, at 39th and Fessenden Streets, N.W. Capitol Hill is about El. 70. The area west of 16th Street, N.W., in Rock Creek Park is quite rugged with a number of places where the land rises to El. 300 and over. At Fort DeRussey, just northerly of Military Road, the high point is at about El. 350. Along the northwesterly boundary of the District at the junction of Western Avenue and Connecticut Avenue, N.W., (Chevy Chase Circle) the surface is about El. 354. Rock Creek at the northwest boundary of the District is at about El. 170.

Southeasterly of Anacostia River and easterly of Potomac River in the southerly part of the District, the land surface is low and flat along the rivers, as in Bolling Air Force

Base and Anacostia Naval Air Station. The remainder of this part of the District is hilly, reaching elevations between 200 and 300 in several areas. One of the highest points is Fort Dupont near the southeasterly boundary of the District and near the junction of Ridge Road and Alabama Avenue, S.E.

Except for the low-lying lands along the rivers, the terrain of the District is favorable for the design of sewers and drains because of the good slopes that can be obtained. One notable exception is the "bowl-like" low area in the vicinity of 5th and Ingraham Streets, N.W., which is surrounded by higher territory, and which has been subject to severe flooding in times of heavy rains. There are a few other such "bowl-like" areas, but the flooding reports do not indicate conditions as bad as those at the above location.

9. Soil Structure (Subsurface Conditions)

Bedrock. A map which accompanies Geological Survey Professional Paper 217,[1] entitled "Configuration of the Bedrock Surface of the District of Columbia and Vicinity," indicates that the bedrock surface beneath the District forms an inclined plane which is about 700 ft. below mean sea level along the southeasterly boundary line of the District and is about 380 ft. above sea level at points near the northwesterly boundary line of the District.

The bedrock surface is shown on the map mentioned above to be at sea level along a northwest-southeast line which passes just northwest of the Lincoln Memorial, thence goes through McMillan Reservoir, and crosses the northeasterly boundary line of the District just northwest of Avondale.

In the valley of Rock Creek and in the rolling lands to the west the rock crops out, at elevations up to 380 ft. above sea level, but east of Rock Creek valley the bedrock surface slopes down steadily southeastward, with the result that it is as much as 900 ft. below the surface at the southeasterly boundary line of the District.

The bedrock is made up of crystalline rocks, principally granite, granite gneiss, schist, and diorite. The rocks are hard and either massive or slabby except where they have been weathered. In places, they have disintegrated to depths as great as 50 ft., forming what may be called "rotten rock."

Overburden. Several unconsolidated sedimentary formations overlie the bedrock. The first layer above the rock is composed of the oldest of the sedimentary formations and is known as the Potomac group. It consists of sand and clay, sometimes in separate lenses and sometimes mixed, together with some gravel which is derived from disintegration of the old rocks. This layer is exposed at places on valley slopes in a broad belt that includes all but the northwestern edge of the District. To the eastward, this layer thickens to nearly 1,000 ft.

Above the Potomac group are other formations of sedimentary sands and clays. These formations crop out east of the Anacostia River.

Next above these formations are the remnants of a sheet of gravel, sand, and loam which formerly mantled the District but which has been mostly worn away by erosion.

Most of the older part of the District is built on a succession of terraces that descend from the old high plateau to the flats along the Potomac and Anacostia Rivers. These terraces are formed chiefly of gravel, sand, and loam.

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1. This is the source of the information in this Section 9.

Finally, the low lands along the Potomac River and its tributaries are mainly deposits of sand and clay laid down by the streams. They have a preponderance of fine-grained material and may be as much as 25 ft. thick.

10. Climate[1]

The District of Columbia, or Washington, as it is commonly referred to in climatic reports, for the 84 years of record (1871 through 1954) has had a mean daily average temperature of 56.0 deg. F. (degrees Fahrenheit).

During this period of record there have been 40 hot spells in summer when the maximum daily temperature was 100 deg. F. or greater. On the other hand, there have been 33 days when temperatures of zero or below have been experienced during the winters of the same 84 years. The winters are generally mild but the summers are hot and at times humid.

The annual rainfall at Washington for the years 1871 through 1954 has varied from a maximum of about 61 in. (inches) to a low of about 22 in. The normal annual rainfall is 41.95 in.

During the years of record there have been only a few heavy snowfalls, the greatest being that of January 27 to 29, 1922, which amounted to 28 in. On March 28 and 29, 1942, there was a snowfall of 11.5 in.

Washington has suffered from few tornadoes. However, in recent years it has suffered frequently from hurricanes accompanied by heavy rains.

Intense rainfalls in the District will be referred to in another chapter herein.

11. Water Quantities (Consumption)

A study has been made of the past, present, and estimated future water consumption in the District and in the W.S.S.D., to aid in computations of sewage flows for the design of sewers.

District of Columbia. Data on the water consumption for the District are given in Table 2. These quantities, herein termed water consumption, are the quantities of filtered water delivered to the water mains, including leakage and other unaccounted-for water. For the years shown, the yearly average water consumption per capita per day has varied from 153 gcd. (gallons per capita per day) in 1920 to 190 gcd. in 1951. In 1955 it was 168 gcd., and in 1956 it was 156 gcd. The ratio of the maximum day's consumption to the yearly average has varied from 1.29 in 1950 to 1.66 in 1956.

It is estimated that the yearly average water consumption in the year 2000 will be 210 gcd. or 236 mgd. (million gallons per day) and the maximum daily use will be 315 gcd. or 354 mgd., which is 1.50 times the yearly average per day.

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1. Data taken partly from "The Climatic Handbook for Washington, D.C.," Weather Bureau Technical Paper No. 8, January 1, 1949, and partly from "Local Climatological Summary with Comparative Data," 1954, published by the U. S. Weather Bureau.

Table 2. Water Consumption in District of Columbia[1]

Calendar year	Population,[2] District of Columbia	Water consumption,[3] District of Columbia				
		Yearly average		Maximum day		Ratio, maximum day to yearly average
		mgd.	gcd.	mgd.	gcd.	
			(3)÷(2)		(5)÷(2)	(5)÷(3)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1900	278,718	48.5	174	--	--	--
1910	331,069	58.2	176	--	--	--
1920	437,571	66.7	153	--	--	--
1930	486,869	85.6	176	--	--	--
1940	663,091	106.5	161	144.7	218	1.36
1950	802,178	151.9	189	195.2	243	1.29
1951	819,000	155.9	190	208.4	255	1.34
1952	828,000	155.3	188	222.1	268	1.43
1953	846,000	152.2	180	232.9	275	1.53
1954	849,000	148.0	174	227.4	268	1.54
1955	853,000	143.4	168	223.0	261	1.56
1956	866,000	135.0	156	224.3	258	1.66
2000	1,125,000	236	210	354	315	1.50

1. See Table 6 in investigative report of June 1955. Certain minor revisions and additions have been made.
2. U. S. census, from 1900 to 1950; estimated, from 1951 to 2000.
3. Filtered water delivered to the water mains, including leakage and other unaccounted-for water.

Records of the Department of Sanitary Engineering of the District show that about one-half of the total water supply in the District is used by the so-called "domestic" consumers, about 25 percent by the so-called "commercial and industrial" consumers and the remaining 25 percent is for District and Federal Government users. However, these percentages are approximate, since the District's classification of consumers as "domestic" or "commercial" is based on meter size and the relative amount of water used as compared with that represented by the minimum bill, rather than on the actual nature of the consumer.

Use of water by actual domestic consumers in the District is estimated to be about 55 to 60 gcd. It has been assumed that this may increase to 65 gcd. by the year 2000.

Washington Suburban Sanitary District. The yearly average water consumption in W.S.S.D. was about 81 gcd. in 1944, 79 gcd. in 1946 and 1954, and about 78 gcd. in 1955, as compared with the low value of 72 gcd. in 1948. These figures are considerably less than the corresponding figures for the District.

This is due to the fact that the consumption in the W.S.S.D. is largely for domestic purposes, while that in the District is also for governmental, industrial, commercial, and other uses peculiar to the District.

Further details for the years 1942 to 1956, inclusive, are given in Table 3.

The domestic use of water in the suburban areas has been assumed to be about 65 gcd. in the year 2000, the same as for the District.

Table 3. Water Consumption in Washington Suburban Sanitary District[1]

Calendar year	Estimated number of persons served, yearly average	Yearly average water consumption, W.S.S.D.	
		mgd.	gcd. (3)÷(2)
(1)	(2)	(3)	(4)
1942	126,300	9.20	72.9
1943	138,800	10.39	74.8
1944	151,300	12.23	80.9
1945	163,800	12.55	76.6
1946	183,700	14.51	79.0
1947	211,100	15.44	73.2
1948	238,500	17.17	72.0
1949	265,900	19.84	74.6
1950	293,300	21.51	73.4
1951	330,000	25.5	77.3
1952	369,000	28.0	75.8
1953	396,300	31.0	78.3
1954	420,800	33.2	78.8
1955	450,500	35.1	77.8
1956	482,000	36.9	76.6

1. See Table C-1 in investigative report of June 1955. Data for 1955 and 1956 have been added, and certain data revised.

Variation in Water Consumption. The quantity of water used in the District on the maximum day of the year is about 1.5 times the yearly average consumption per day. The maximum hour's use may be about 1.5 times the maximum 24-hr. (hour) use. Therefore, the maximum hourly use may be as much as 2.25 times the yearly average consumption per day.

The quantity used in the W.S.S.D. on the maximum day of 1955 was 63.5 mgd., which is equivalent to about 1.8 times the yearly average consumption for 1955. The consumption on the maximum day of 1956 was 62.0 mgd., which is equivalent to about 1.7 times the yearly average consumption for 1956.

Summary. Following is a summary of the principal data on water consumption referred to above:

	District of Columbia, yearly average		W.S.S.D., yearly average	
	gcd.	mgd.	gcd.	mgd.
Consumption				
Maximum year	190	155.9	77	36.9
Estimated for year 2000	210	236	85	63

	District of Columbia, yearly average		W.S.S.D., yearly average	
	gcd.	mgd.	gcd.	mgd.
Use by domestic consumers				
Unit quantities of record	55-60	--	--	--
Estimated for year 2000	65	--	65	--

12. Receiving Waterways

Surface water draining from the land in the District is carried off by Potomac River, Anacostia River, Rock Creek, Foundry Branch, Oxon Run, and their minor tributaries.

Potomac River. This river forms a boundary of the District for a length of over 11 mi. Below the vicinity of Key Bridge the river is a tidal estuary, very broad for most of its length. The United States Geological Survey Gaging Station, located about 2 mi. upstream from the northwesterly boundary of the District and below the intake of its water supply, recorded the maximum discharge of 484,000 cfs. (cubic feet per second) on March 19, 1936, and the minimum daily discharge of 448 cfs. on August 25, 1930, for the drainage area of 11,560 sq. mi. The average discharge for the 21 years, March 1930 to September 1951, is 11,280 cfs.[1] Monthly mean flows below 2,000 cfs. have occurred during the six warmer months, and weekly averages below 1,000 cfs. have been recorded.[2]

Below Three Sisters Islands, just above Key Bridge, the tidal range is only about 2.9 ft. on the average, tidal action is slow, and there is a reversal in direction of flow at times and at some points, with the changes in tide. There is, in some instances, an upstream current off Hains Point during an incoming tide, but there may be slack water here for a time during that tidal period.

At a discharge rate of 2,000 cfs., the time of flow from Key Bridge to the District Sewage Treatment Plant outlet, less than 7 mi., is about 8 days, and for a rate of 1,000 cfs., the time is about 16 days.[3]

Tidal Basin. This artificial pond, located in West Potomac Park adjacent to Potomac River, with a water-surface area of 111 acres, is a favorite recreational area for visitors as well as for residents of the District. Jefferson Memorial and the cherry trees are the principal attractions. Small boats may be rented in the Basin.

During rising tide in the Potomac, water flows from the river through automatic tide gates into the Basin; and with the falling tide in Potomac River, water flows out from the Basin through gates into Washington Channel and thence into Anacostia River at Hains Point. This creates something of a circulation through the Basin which tends to flush it, but there is a lag in effect so that the Basin does not get the full effect of the tidal range. Currents through the gates are noticeably swift but the water in many parts of the Basin along the shores is quiet so that some debris collects to form unsightly accumulations.

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1. U. S. Geological Survey Water Supply Paper 1202, page 484, 1951.
2. A "Report on Water Pollution in the Washington Metropolitan Area," Interstate Commission on the Potomac River Basin, Sec. II, Technical Report, page 6, February 1954.
3. See reference 2 above, following page 6 thereof.

There are trash racks on the upstream side of the inlet gates which are intended to hold back floating debris in Potomac River.

Stormwater from the Old B Street Stormwater Sewer is discharged into the Basin at times of surface-water runoff, and drainage enters, also, from adjoining highways and shore areas.

Washington Channel. This is a waterway lying between the Maine Avenue waterfront and East Potomac Park. The Channel is an active area for pleasure boats and commercial fishing boats. It is an anchorage for those boats as well as a means of access to the docks, yacht club, and boat yards. The Channel is nearly 2 mi. long, and varies in width from 800 ft. at the north end to 1,000 ft. at the south end at Hains Point and Anacostia River.

The water in the Channel rises and falls with the tide. Water enters the Channel from Anacostia River with the incoming tide and from Tidal Basin during the outgoing tide. In this way there is some change in water and some flushing, as described above.

There are 13 stormwater overflows into the Channel from the Maine Avenue Interceptors and tributary combined sewers, the largest of these overflows being that at the end of L Street, S.W., which is 10 ft. in diameter. During periods of surface-water runoff, considerable amounts of stormwater mixed with some sewage are discharged into Washington Channel from these overflows.

The following statements quoted from Section II of the Interstate Commission report concern the pollution of Washington Channel and Anacostia River from houseboats and other vessels:[1]

> A report from the D.C. Harbor Police concerning the boats anchored along the Washington Channel and the Anacostia River revealed that 68 boats were occupied with a combined total of 113 persons living aboard in 1952. All of these boats discharge sanitary sewage directly to the water and many of the occupants throw garbage and other litter overboard. It is probable that the occupancy of these boats doubles during the weekends. In addition, there are a bay steamer and an excursion vessel, vessels of the U. S. Coast Guard, the D. C. Harbor Master, and the D. C. Fire Boat--all located on the Washington Channel, as well as a number of regular naval vessels stationed in the Anacostia River, all with crews living aboard.
>
> Control of pollution from these sources obviously presents many inherent difficulties, both technically and administratively. On the technical side, no suitable means of satisfactorily disposing of such sewage has been developed. This must be approached in cooperation with boat designers. First of all, a suitable system that can be installed on the craft must be devised. Prevention of the discharge of both sewage and garbage from houseboats and other vessels should be attacked vigorously by both education and preventive measures from the educational standpoint. Because of the grossly polluted nature of the waters throughout the area at present, pollution caused by boats of all types hinges largely on the aesthetic aspects. This is an extremely important item in these waters.

1. "Report on Water Pollution in the Washington Metropolitan Area," Section II, Technical Report, page 15, Interstate Commission on The Potomac River Basin, February 1954.

Anacostia River. This river is formed by the junction of the Northeast Branch, which at Riverdale has a drainage area of 72.8 sq. mi., and the Northwest Branch, which at a point 1 mi. west of Hyattsville, has a drainage area of 49.4 sq. mi. The total drainage area of Anacostia River at its mouth is about 170 sq. mi.

The lower section of the river, except during floods, is very sluggish, and the currents are generally due to the tidal effect.

The combined average rate of discharge of the two branches for the 13-year period, July 1938 to September 1951, was about 115 cfs. The minimum discharge for the Northeast Branch was 5.6 cfs.,[1] and for the Northwest Branch, 0.8 cfs. The low flow of the Northwest Branch in the past has been regulated by storage and diversion of water at Burnt Mills Dam about 7 mi. above the gaging station,[2] and by inflow pumped from Patuxent River into the Branch above the dam, for the water supply of the W.S.S.D. This water is now used only as a reserve supply.

Rock Creek. This creek rises in Montgomery County, Maryland, and flows southerly through Rock Creek Park, the Zoological Garden, and the Rock Creek and Potomac Parkway, in the District, a distance in the District of about 9.2 mi., to the point of its discharge into Potomac River. The total drainage area is about 77.6 sq. mi. Rock Creek at Sherrill Drive Bridge, 7-1/2 mi. upstream from its mouth, has a drainage area of 62.2 sq. mi. At this point the average discharge for the 22 years of record, October 1929 to September 1951, was 54.9 cfs.[3] The maximum discharge was 7,220 cfs., on July 21, 1956, and the minimum, 0.5 cfs., October 1 to 7, 1930.[3]

Rock Creek Park, through which this creek flows, has great natural beauty. The creek itself is one of the principal assets of the area, although it is contaminated by sewage in the lower reaches at times of intense rainstorms, through overflows from combined sewers.

Foundry Branch. This stream is the main drainage channel for an area of 1.9 sq. mi., all within the District. It discharges into Potomac River upstream from the mouth of Rock Creek. The tributary area is divided into 467 acres sewered on the combined system and 740 acres on the separate system. There are no stormwater overflows from combined sewers connected to this stream.

Oxon Run. This stream rises in Prince Georges County, Maryland, and flows in a southwesterly direction through the southeasterly part of the District and thence in the County along the District boundary into Oxon Run Bay and Potomac River, south of the sewage treatment plant. The entire drainage area within the District as well as the sewered portion of the area in the W.S.S.D. (in Prince Georges County) is sewered on the separate system. The total drainage area of the stream is 13.5 sq. mi., of which 2,233 acres are in the District and 6,400 acres are in the W.S.S.D.

High Water. A study of the high-water records in Potomac and Anacostia Rivers has made it possible to establish controlling water-surface elevations, or hydraulic grade lines, at the rivers where sewer outlets are located or are to be located. It is not necessary that the design hydraulic grade line at the sewer outlets be high enough for the highest river

1. Gaging Station on Northeast Branch is located on the downstream side of Riverdale Road bridge.
2. Gaging station on Northwest Branch is located on the downstream side of Queens Chapel Road bridge.
3. Average and minimum discharges are from U. S. Geological Survey Water Supply Paper 1202, 1951, page 486.

stages but that provision be made for what might be termed "normal" high water which may occur during the season of intense rain storms. The simultaneous occurrence of high water in the rivers and of a storm of design intensity is unlikely.

Chapter 9 of the investigative report of June 1955 gives a tabulation of high-water elevations in the rivers, and a detailed discussion of their bearing on sewer design.

From this study it was concluded that the following hydraulic grade line elevations are satisfactory for sewer design:

Location	Elevation
Wisconsin Avenue on Potomac	5.0
Main Sewage Pumping Station on Anacostia	4.0

The elevations given above are intended to be the minimum values, with the thought that somewhat higher values might well be used where economic and available head conditions permit or where additional height above ordinary high water might be desired for special reasons. At other locations, elevations proportional to, or based upon, those given above would be used.

CHAPTER H

RELIEF PROJECTS FOR INTERCEPTING SEWERS

1. General Statement

As previously explained (Chapter A, Section 2; Chapter D, Section 2; Chapter E, Section 1; and Chapter F, Section 1), the District is served by a system of intercepting sewers which convey the dry-weather flow of sewage, plus a small amount of stormwater, to the sewage treatment plant at Blue Plains, and which are shown on Figs. 1 and 2, in Chapter A. These sewers are described in Chapter 5 of the investigative report of June 1955.

Adequacy of Existing Interceptors. The present and required capacities of the existing intercepting sewers, as given in Chapter 16 of the investigative report of June 1955, indicate that relief is needed for most of the interceptors. In some cases, revised computations made by the Board of the required capacity provide for increased tributary populations and areas for Maryland (W.S.S.D.) and reduce the allowance for groundwater infiltration in the Maryland areas from 700 gad., as previously used, to 400 gad. The latter revision has been made by the Board because most of the sewers in the Maryland area which will be tributary to the District sewer system by the year 2000 (the year of design) either are new sewers or are not yet built. It has been assumed that, as a rule, these sewers will have tighter joints that the older sewers in the District, which already have been in use for varying periods of years. It is considered that modern improvements in piping and jointing materials, as well as construction procedures, will result in reduced infiltration. For one thing, most of the pipe sewers built in the District prior to 1928 were constructed of "cylinder" pipe, without hubs or bells and with only cement mortar or concrete jointing material.

Furthermore, the information given in the investigative report of June 1955 is based on suggested values of the factors used for computing the flow to be intercepted from combined-sewer systems, as shown in Table F-7 of that report. The Board's studies have resulted in revisions of certain of these factors, as explained later in this chapter.

The revised computations made by the Board also show that the existing interceptors are inadequate in most cases. Indeed, information given in Chapter F on sewer overflows to the streams shows that certain of the interceptors are now grossly inadequate and need relief urgently, as substantial overflows of dry-weather sewage to the streams now occur on numerous days of the summer months. Information presented in subsequent portions of this chapter shows, also, that these intercepting sewers need relief urgently.

Information given and referred to in the Board's report of October 31, 1956, upon the District's Sewage Treatment Plant indicates that the pollution of the Potomac and Anacostia Rivers, as well as of Rock Creek, is aggravated by the sewer overflows, and that abatement of the resulting nuisance is urgently needed. Such abatement is regarded by the Board as one of the District's most pressing problems.

Effect of Combined Systems. The intercepting sewer system serves a large area now sewered on the combined plan, as shown on Fig. 2. Insufficient capacities result in overflows to the streams of mixed sewage and stormwater during all but the lightest storms, as

previously explained. It is necessary, in solving the stream pollution problem, either to eliminate such overflows by converting the combined systems to separate systems, or to reduce the overflows to an acceptable frequency and duration by the construction of larger interceptors or by a combination of larger interceptors and conversion of portions of the combined systems to separate systems. The general aspects of this problem are discussed in Chapter G.

Thus, the problem of relief interceptors is inseparably linked to the future use of combined sewers. Therefore, the Board has studied alternate projects for solving these problems. The alternate projects are discussed in the remainder of this chapter.

General Basis for Interceptor Design. It seems clear that the intercepting sewer system should be given capacities somewhat greater than the anticipated peak dry-weather sewage flows in the tributary combined sewers, so as to provide some dilution by stormwater before the mixed sewage and stormwater is overflowed to the streams. This is good practice. There are two common methods of computing the required stormwater quantity for interceptor design, as described below.

Under one method, the interceptors would be given a capacity, in addition to the normal dry-weather flow, to provide for the runoff estimated to result from a definite rainfall intensity. An early example of this method is afforded by interceptors for Minneapolis and St. Paul, Minnesota, the design of which is described in Chapter F, under the sideheading, "Minneapolis-St. Paul, Minnesota." It was estimated, in 1928, that the benefit from increasing the interceptor capacity to carry, for instance, double the amount of stormwater for which the interceptor was designed would not be worth the resulting substantial increase in the cost of the interceptors.

Under the other and more commonly used method, the interceptor would be given a total capacity which is a multiple of the estimated yearly average dry-weather flow in the tributary combined sewers as of the year of design, such as two times, five times, or ten times the yearly average flow, and so on, depending on the degree of protection desired for the stream. The multiplier used is sometimes called a "dilution factor." This factor obviously should be greater than that necessary to give just the instantaneous peak dry-weather flow. Otherwise, when storms occur at the time of the estimated peak dry-weather flow, no dilution would be provided before overflow begins. Also, if the dry-weather peak flow should exceed the estimated quantity, overflow of undiluted sewage to the stream would occur during dry weather.

Certain design computations were made by the Board to compare the results of using the two methods discussed above, and it was decided to use the second method as being the more suitable for this study. Therefore, the studies of alternate projects described herein are based on various "dilution factors." Chapter F gives a discussion of dilution factors, including information upon values computed for existing interceptors in the District and elsewhere, and information upon the effect in certain cases of using various dilution factors for interceptor design.

Attention is directed to the fact that the computed "yearly average dry-weather flow," as used herein, includes an allowance for groundwater infiltration. The groundwater is really diluting water, insofar as the sewage is concerned, so it can be said that the actual dilution may be slightly greater than indicated by the factors given. If the groundwater infiltration is less than estimated, then the capacity for diluting stormwater would be greater than indicated by the dilution factors, and vice versa.

Cost Estimates. Cost estimates have been made for the proposed relief sewers, based generally on the basic cost data given in Appendix 1. These estimates include an allowance for contingencies and engineering, and are based on approximate present price

levels (Engineering News-Record Construction Cost Index of 700). The cost will, of course, be greater than shown if the price level rises before construction is undertaken.

Cost estimates for converting combined systems to separate systems are given and discussed in Appendix 2.

2. Brief Description of Alternate Projects

Outline of Projects A, B, and C. Three alternate projects have been studied in connection with the intercepting sewer system and stream pollution abatement, called Projects A, B, and C. In addition, modifications or variations of certain of these projects have been considered and rejected. These three projects are shown on Figs. 14, 15, and 16, which are bound at the end of this chapter.

Project A (Fig. 14) contemplates the conversion of all combined systems to separate systems, a method which should eliminate overflows of mixed sewage and stormwater to the streams. The intercepting sewers, under this project, would become separate trunk sewers, and dilution factors would not be applicable.

Project B (Fig. 15) contemplates the early conversion from combined to separate systems of two small areas: one located adjacent to Potomac River a short distance downstream of the mouth of Rock Creek, and the other located southeasterly of Anacostia River a short distance upstream of Poplar Point Sewage Pumping Station; plus one fairly large area located south of Independence Avenue and east of Washington Channel; with various dilution factors applying to the interceptors serving the remaining combined systems, as will be explained. No separation of combined-sewer area tributary to the upper Potomac is included.

Project C (Fig. 16) contemplates the early conversion to separate systems of the same three areas as in Project B, plus another fairly large area which is located in and adjacent to the Foundry Branch section, upstream of Rock Creek; with various dilution factors for the interceptors serving the remaining combined systems, as will be explained. Project C gives more removal of pollution to the upper Potomac and less removal to the lower Potomac and the Anacostia Rivers than Project B.

Table 21 summarizes the scope of the alternate projects in greater detail than given above.

Matters Relating to All Projects. Much of the Luzon Valley (C-11) and the Klingle Road (C-18) Sewer districts has been converted to separate systems, but the work is not yet complete. In the Board's study, it has been assumed that the conversion work in these districts will be completed, in any event, and the districts are shown on Figs. 2, 14, 15, and 16 as having separate-sewer systems. The estimated cost of completing the conversion in these districts is included in the Board's estimates.

The cross-hatched area marked "Area Z" on Figs. 14, 15, and 16, is treated as a separate-system area, in the projects studied by the Board, since the conversion of this area to separate systems has previously been authorized by the District Commissioners. The work needed in Area Z, to accomplish the conversion, is not included in Projects A, B, and C. This area is bounded by the existing B Street-New Jersey Avenue Trunk Sewer, Independence Avenue, 15th Street, S.W., Washington Channel, and Anacostia River. The estimated cost of the conversion work in this area is not included in the Board's estimates given herein.

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Table 21. Outline of Alternate Projects A, B, and C

Project	Combined sewer districts to be converted to separate systems[1]	Project shown on Fig. No.:	Dilution factors for interceptor design	Location of proposed overflows from interceptors to streams[2]
(1)	(2)	(3)	(4)	(5)
A	All districts	14	None: all interceptors would become separate trunk sewers	None
B	E-1 E-3 (part)[3] E-4, -5, -7 E-8 (part)[3] I-1 (part)[4]	15	200[5] (approximately) for interceptors and other sewers serving combined sewers having overflows to Rock Creek; 30 for interceptors serving combined systems having overflows to upper Potomac River[6]; 10 for all other interceptors upstream of vicinity of Hains Point, including those along Anacostia River; and 5 for relief intercepting sewers downstream of vicinity of Hains Point	Potomac River: one overflow[7] between Rock Creek and outlet of Easby Point Trunk Sewer, and two overflows in vicinity of Hains Point
C	A-8 (part), A-9, A-10 E-1 E-3 (part)[3] E-4, -5, -7 E-8 (part)[3] I-1 (part)[4]	16	200[5] (approximately) for interceptors and other sewers serving combined sewers having overflows to Rock Creek; 30 for interceptor serving Sewer Districts A-11 and A-12, and for interceptor serving East and West Rock Creek Diversion Sewers, continuing only as far downstream as proposed Potomac River Sewage Pumping Station; and 5 for all other interceptors.	Potomac River: one overflow[7] between Rock Creek and outlet of Easby Point Trunk Sewer

1. See Fig. 2 for location and extent of the sewer districts. Under all projects, Sewer Districts C-11 and C-18, which previously have been partly converted to separate systems, would be completely converted.
2. Under all projects, there would be an overflow in the vicinity of the sewage treatment plant. This proposed overflow is not shown in the table.
3. The District government has adopted a program of converting to separate systems all of the combined sewers in the area bounded by the existing B Street-New Jersey Avenue Trunk Sewer, Independence Avenue, 15th St., S.W., Washington Channel, and Anacostia River.
4. The small combined-system area east of Anacostia River.

Note: Footnotes are continued on next page.

5. This value, 200, corresponds approximately to a 2-year rainstorm, which is to be used for one design of Rock Creek Overflow Sewer (see text). If a 5-year storm should be used, the dilution factor would be approximately 240. Flow in this overflow sewer exceeding 30 dilution factor would be discharged to Potomac River near mouth of Rock Creek. Note: A larger dilution factor, 375, is proposed for Piney Branch, as explained later in the text.
6. "Upper Potomac River" here means the portion upstream of the proposed Potomac River Sewage Pumping Station (see Figs. 14, 15, and 16 for approximate location).
7. At proposed Potomac River Sewage Pumping Station (see footnote 6).

There are three principal interceptors which serve the major portion of the combined-sewer area. These are: Upper Potomac Interceptor, Rock Creek Main Interceptor, and East Side Interceptor. The first two extend into Maryland and serve large areas and populations of the W.S.S.D. All three of these interceptors serve large areas of separate systems, along the upstream reaches, where they really are separate trunk sewers. They become true interceptors in their downstream reaches, where they serve combined-sewer systems. Therefore, consideration of these interceptors has a bearing on Projects A, B, and C only through their downstream reaches. The deficiencies in capacities and the relief sewers needed through the upstream reaches of these three interceptors are the same for all projects. The cost of these relief sewers is included in the Board's estimates.

The B Street-New Jersey Avenue Trunk Sewer now serves as a combined sewer and interceptor. Under all three projects it would continue to serve as a combined sewer, but its service as an interceptor would be terminated and the dry-weather or "sanitary" flow which would otherwise go into this combined sewer at its upstream end near 27th and G Streets, N.W., would be diverted to a proposed relief sewer located parallel to, or in the vicinity of, the northeasterly bank of Potomac River. The proposed relief sewer is called the Potomac River Force Main. The B Street-New Jersey Avenue Trunk Sewer would thereafter serve only as a combined sewer, as stated.

Under Projects B and C, many, if not all, of the existing intercepting connections would need enlarging so as to provide the desired dilution factors. An allowance has been included in the Board's estimates, for this work.

In connection with the dilution factors given in Table 21, attention is directed to the effect of the tributary separate systems on the dilution factors computed for the flows in the various interceptors. This effect is illustrated in the following paragraph by conditions applying to the lower end of the Upper Potomac Interceptor, although similar conditions apply to all of the intercepting sewers, including the outfall sewers to the sewage treatment plant.

Fig. 15 shows that the lower end of the proposed Upper Potomac Interceptor Relief for Project B would have a dilution factor of 11.7. This means that the required capacity of the relief interceptor is 11.7 times the yearly average dry-weather flow therein, as of the year 2000. However, the required capacity is computed so as to provide a dilution factor of 30 for each of the tributary combined sewers, meaning that no overflow to the Potomac River through the overflow outlet of any of the combined sewers would occur until the interceptor is taking from that combined sewer at least 30 times the yearly average dry-weather flow in the combined sewer. But the dry-weather flow from the tributary separate sewers upstream also is flowing in the interceptor, so when this dry-weather flow is added to the dry-weather flow from the combined sewers, and the total divided into the required interceptor capacity, the resulting dilution factor for the flow in the interceptor is less than 30. The computations are as follows:

Yearly average dry-weather flow (year 2000), cfs.[1]	
From separate systems upstream	17.95
From combined systems	8.40
Total	26.35
Required capacity of interceptor, cfs.	
For separate systems[1]	56
For combined systems (8.4 x 30)	252
Total	308

$$\text{Dilution Factor} = \frac{\text{Total required capacity}}{\text{Total av. dry-weather flow}} = \frac{308}{26.35} = 11.7$$

In planning the proposed works, screening facilities have been included for the proposed sewers which will discharge to the outfall sewers or to the sewage treatment plant, in accordance with the recommendation on page 23 of the Board's report on "Sewage Treatment Plant," dated October 31, 1956.

In making the studies, the Board has considered the desirability of constructing certain of the proposed conduits in the bed of the Potomac or Anacostia River, where the conduits would otherwise be located near, and more-or-less parallel to, the river bank. Such construction would involve subaqueous work, which is estimated to cost at least 50 percent more than the cost of work on land. In the case of the smaller sewers, the increase in cost is estimated to be as much as 100 percent. These estimates are based on available information upon underground strata along the line of the proposed work, together with consideration of the cost of similar work elsewhere. Future access to the sewer if built within the river bed would be more difficult and more expensive than in the case of a sewer on land, thus resulting in difficult and costly maintenance work throughout the life of the sewer. For these reasons, the Board has shown these conduits located on land, rather than beneath the river bed. When contract drawings are being prepared, it may develop in certain locations that constructing the sewer beneath the river bed should be considered, after complete information is obtained on surface structures and underground strata.

3. Project A

General Description of Project A. Project A, shown on Fig. 14, is based on the conversion of all combined sewers in the District to separate systems. There would be no planned overflows of sewage or of mixed sewage and stormwater to the streams. All of the existing interceptors and so-called interceptors would become separate trunk sewers, and the hydraulic and design computations referred to herein have been made accordingly.

Relief sewers would be needed for the entire Upper Potomac Interceptor, for portions of the Rock Creek Main Interceptor, for the portion of the East Side Interceptor downstream of the point where it crosses the Northeast Boundary Trunk Sewer, and for the Outfall Sewers downstream of a point near the Poplar Point Sewage Pumping Station.

Two new sewage pumping stations would be required: one near the Potomac River southeasterly of the mouth of Rock Creek, and the other near the East Side Interceptor a short distance northerly of where it crosses the Northeast Boundary Trunk Sewer.

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1. From basic design data given in Chapter E, which includes the stormwater allowance indicated on Fig. 6.

The first new station would handle all dry-weather flow from Rock Creek valley, including the flow from the existing Upper Potomac Interceptor and its proposed relief sewer, as well as the dry-weather flow from Sewer Districts E-1 and E-2, the latter now being served by the Easby Point Trunk Sewer (Fig. 2, Chapter A). In addition to the dry-weather flow, this pumping station would handle the stormwater from areaways and depressed driveways as authorized and as shown on Fig. 6, Chapter E.

The other new pumping station would handle flow from the existing East Side Interceptor.

The proposed relief sewers immediately downstream of the new pumping stations would be force mains (pressure sewers) for a distance. Downstream from the force mains, the proposed relief sewers would be gravity conduits.

Under Project A, the existing sewage pumping stations would not require additional capacity, as sufficient flow would be diverted from their tributary sewers to enable the present stations to handle the remainder of the flow. This applies, also, to the siphons under Anacostia River at the Main Sewage Pumping Station and to the Outfall Sewer from the siphons to a point near the Poplar Point Sewage Pumping Station, as both would be adequate after the construction of the works included in this project.

The only overflows to streams, in Project A, would be those necessary at sewage pumping stations, and possibly elsewhere, for emergency bypassing in the event of power failure or other emergency which might necessitate such bypassing.

Upper Potomac Interceptor. The existing Upper Potomac Interceptor, described briefly on page 20 of the investigative report of June 1955, serves a fairly large area and population in Maryland, as well as in the District, and is expected to serve a still larger area and population in Maryland by the year 2000.

The tributary population in the District, as estimated for the year 2000, is 89,280, including 79,430 population tributary directly to the interceptor and 9,850 population for the West Rock Creek Diversion Sewer, which is tributary a short distance upstream from the outlet of the interceptor at the Rock Creek Sewage Pumping Station.

The corresponding population in Maryland, as estimated by the Board, is 123,000. This gives a total tributary population of 212,280 for the year 2000.

The Maryland population would be tributary to the District sewer system at two sewers: 85,000 for the Upper Potomac Interceptor, and 38,000 for the Falls Branch Trunk Sewer, where each crosses the District line. The latter sewer discharges to the interceptor a short distance inside the District.

The net areas are as follows: 3,618 acres for the District, including 371 acres for the West Rock Creek Diversion Sewer; and 9,470 acres for Maryland. The latter is an estimated area, based on 123,000 population divided by 13 persons per acre. The total of the net areas inside and outside the District is 13,088 acres.

The Maryland estimated net area where the interceptor crosses the District line would be 6,540 acres, and the corresponding Maryland area tributary where the Falls Branch Trunk Sewer crosses the line is 2,930 acres.

The Upper Potomac Interceptor actually serves as an interceptor only from Glover-Archbold Parkway (Foundry Branch Combined Trunk Sewer), Point 3 on Fig. 14, to the outlet at Rock Creek Sewage Pumping Station. Upstream of that Parkway, the sewer serves as a separate trunk sewer. The data given herein for the latter or upstream portion, therefore,

will apply to Projects A, B, and C, since the conversion of combined sewers to separate systems would have no effect here.

The existing Upper Potomac Interceptor is deficient in capacity in Project A through 98 percent of its length, as of the year 2000. The over-all capacity of the deficient portion is approximately 40 percent of the required capacity.

Numerous spot depth-of-flow measurements made during the middle of the day in this sewer on various dates during recent years, the latest in December 1955, at three locations extending from a point near Key Bridge to a point near Chain Bridge, show the depth of flow in the sewer to be from 40 to 60 percent of its depth full, on most of the observation dates.

An overflow gage maintained in this sewer since March 1956, near Potomac Street, showed three occurrences of overflow to the Potomac River during the past summer, in June and July (Tables 16 and 17, Chapter F, Gage No. 9). However, the durations of the overflows were very short, being about 30 minutes for each occurrence.

Therefore, it is concluded, in Project A, that the Upper Potomac Interceptor would need relief in the near future throughout its entire length. In view of additional anticipated early development in the tributary area in Maryland, it appears desirable to give this relief sewer a fairly high priority in a construction schedule. The time of needing the relief sewer can be judged more accurately on the basis of a continuous record of the flow in the existing sewer, and it is understood that such a record will be obtained at or near the District line, by means of a flow-gaging station soon to be established by the District and the W.S.S.D. It is important that such information be obtained.

It is important, also, that overflows of sewage from this sewer to Potomac River be prevented, as this would affect a portion of the river which is the most favorable for recreational and other uses. For this reason, overflow gage No. 9, now in place, should be maintained and continued in operation. Also, it would be desirable to establish a similar gage at a point in Maryland a short distance upstream from the District line, where there appears to be an existing overflow structure on this sewer.

As shown on Fig. 14, a relief sewer has been planned for this interceptor. It would parallel the existing sewer from the District line to a point near Chain Bridge. Here, it would cross the Chesapeake and Ohio canal and then continue, in a southeasterly direction, parallel to, and just southwesterly of, the canal, to a point near Clark Place. From this point to 31st Street, N.W., the relief sewer would be built beneath the canal bottom, except in one short stretch, as space elsewhere is limited. At 31st Street the sewer would leave the canal and follow 31st Street, K Street, and an easement, to a junction with the proposed Rock Creek Main Interceptor Relief at a point east of Rock Creek and south of K Street, N.W., Point 4 on Fig. 14. From this point, the Rock Creek Main Interceptor Relief would run in a southerly direction to the proposed sewage pumping station, as explained when discussing the Rock Creek Main Interceptor.

In planning the location of the proposed relief sewer, consideration should be given to the highway or Expressway (Route 240 Connection) contemplated along or near the northeasterly side of the Potomac River or Chesapeake and Ohio Canal, within the District. It may prove desirable to locate a portion of the relief sewer along such highway.

The proposed Upper Potomac Interceptor Relief would be 23,990 ft. long and would be 48 in. and 54 in. in diameter, for Project A. The total estimated cost is $2,700,000.

Rock Creek Main Interceptor. The existing Rock Creek Main Interceptor, described briefly on page 19 of the investigative report, serves a fairly large area and population in Maryland, as well as in the District, and is expected to serve a still larger area and population in Maryland by the year 2000.

The tributary population in the District, as estimated for the year 2000, is 409,150, including 329,720 population in Rock Creek Valley and 79,430 population in the Upper Potomac Interceptor area. The District population in Rock Creek Valley (329,720) includes 109,640 population tributary directly to the interceptor and its branches, 210,230 population tributary to the East Rock Creek Diversion Sewer, and 9,850 tributary to the West Rock Creek Diversion Sewer.

The corresponding population in Maryland tributary directly to the interceptor is 163,000, to which is added the population of 123,000 tributary to the Upper Potomac Interceptor, all as estimated by the Board, giving a total Maryland population of 286,000 tributary to the Rock Creek Main Interceptor just upstream of its outlet at 27th and G Streets, N.W., for the year 2000.

The total tributary population, therefore, both within and without the District for the year 2000 is 409,150 plus 286,000, or 695,150.

The Maryland population would be tributary at several different locations. Where the Rock Creek Main Interceptor crosses the District line, it is expected to serve 152,000 persons in Maryland by the year 2000, plus 520 persons in the District who are tributary to District sewers discharging to the interceptor inside Maryland. The remainder of the Maryland population (11,000) would be tributary to the interceptor at various places within the District, depending upon the locations of the outlets of the various Maryland sewers which enter the District.

The net area in the District is 11,384 acres, including 8,137 acres in Rock Creek Valley and 3,247 acres in the Upper Potomac Interceptor area, as of the year 2000.

The net areas for Maryland, as estimated by the Board, are as follows: 12,550 acres for the 163,000 population tributary to the Rock Creek Main Interceptor, plus 9,470 acres for the 123,000 persons tributary to the Upper Potomac Interceptor. This gives a total Maryland area of 22,020 acres. The Maryland areas are based, in most cases, on an average density of 13 persons per net acre, using the populations given above.

The total area, within and without the District, therefore, is 11,384 plus 22,020, or 33,404 acres, for the year 2000.

The Maryland estimated area tributary where the Rock Creek Main Interceptor crosses the District line is 11,700 acres for the year 2000.

The Rock Creek Main Interceptor actually serves as an interceptor only from Klingle Road (Point 12b on Fig. 14) to the outlet at 27th and G Streets, N.W. Upstream from Klingle Road, the sewer serves as a separate trunk sewer. The data given herein for the latter or upstream portion, therefore, will apply to Projects A, B, and C, since the conversion of combined sewers to separate systems would have no effect here.

The existing Rock Creek Main Interceptor is deficient in capacity in Project A through 77 percent of its length, as of the year 2000. The over-all capacity of the deficient portion is approximately 54 percent of the required capacity.

Through a length of 5,200 ft., located just upstream of Military Road (from Point 10 to Point 11 on Fig. 14), the interceptor has been reconstructed and enlarged during recent years as a result of a collapse of the sewer, and the capacity of the reconstructed portion is almost equal to the estimated required capacity as of the year 2000. This portion of the sewer, therefore, will not need relief.

Just downstream of Military Road, there is a small deficiency in capacity for about 1,000 ft. (from Point 11 to Point 12). This short stretch will suffice for many years without relief.

Downstream of this short stretch, the existing interceptor is adequate as far as Broad Branch Road (Point 12a).

Downstream of Broad Branch Road, relief will be needed throughout the remainder of the interceptor, except for two comparatively short stretches.

Numerous spot depth-of-flow measurements have been made in the Rock Creek Main Interceptor on various dates during recent years, the latest in December 1955. The measurements were made during the middle of the day. The results are summarized as follows:

Location	Approximate range of majority of measurements, in percent of depth full
Near East-West Highway, in Maryland	55 to over 100[1]
At D.C. Line	85 to 97
Just upstream of Bingham Dr.[2]	28 to 37
Near Milkhouse Ford[2]	26 to 31
Just upstream of Military Rd.[2]	33 to 46
Short distance downstream of Military Rd.	36 to 56
Short distance upstream of Zoo South Gate	50 to 64
At Zoo South Gate	65 to 87
Near Connecticut Ave.	66 to 89
Short distance downstream of Massachusetts Ave.	56 to 70
Farther downstream of Massachusetts Ave.	45 to 61
Short distance upstream of Q St.	59 to 72
Nearer Q St.	50 to 71

1. Surcharged several times, from 1.9 to 6.2 ft. above the sewer crown.
2. Located on reconstructed, enlarged section of the interceptor.

An overflow gage has been maintained for over a year at the downstream end of the Rock Creek Main Interceptor, where it discharges into the B Street-New Jersey Avenue Trunk Sewer at 27th and G Streets, N.W. This gage shows 85 occurrences of overflow to the Potomac River in 12 months (Tables 16, 17, and 18, Gage No. 5, Chapter F), most of them occurring during the summer months. Thirty of the overflows occurred during dry weather.

It is concluded that portions of the Rock Creek Main Interceptor will need relief in the near future. In fact, the need is urgent in certain stretches. The proposed scheduling of the various sections of the relief sewer is given later herein.

It is important that the overflow gage at 27th and G Streets, N.W., be maintained and continued in operation. Also, it would be desirable to establish a similar gage in the vicinity of the District line, unless the flow-gaging station mentioned in the following paragraph would serve for this purpose.

It is understood that a flow-gaging station will be established in the near future at or near the District line, by the District and the W.S.S.D., to obtain a continuous record of the flow in the existing interceptor at this point. It is important that such data be obtained.

As shown on Fig. 14, a relief sewer has been planned for certain portions of this interceptor, as part of Project A. In general, the relief sewer could be constructed more-or-less parallel to the existing interceptor and could be built on either side of it, even crossing it if desired.

The proposed relief sewer has been planned to discharge at Point 14 to the existing East Rock Creek Diversion Sewer, which would serve as a separate trunk sewer, under Project A. This would provide relief for the Rock Creek Main Interceptor downstream of Point 13, and as far downstream as the point where the flow in the East Rock Creek Diversion Sewer is discharged to the interceptor near K Street.

The Rock Creek Main Interceptor downstream of K Street is greatly deficient in capacity, partly because of the discharge of the Rock Creek Sewage Pumping Station, which enters the interceptor at K Street, and partly because the flow from the East Rock Creek Diversion Sewer also enters here. Comments relative to the effect of the pumping station are given on pages G-22 and G-23 of the investigative report of June 1955.

As stated above, under the sideheading "Upper Potomac Interceptor," a relief sewer has been planned south of K Street and east of Rock Creek which would serve both the Upper Potomac Interceptor and the Rock Creek Main Interceptor, thereby taking some of the load from the Rock Creek Sewage Pumping Station as well as from the two interceptors. In fact, it may prove practicable to abandon the Rock Creek Sewage Pumping Station by diverting the entire inflow to the proposed relief sewer. This relief sewer would start at Point 4 on Fig. 14 and extend to the proposed sewage pumping station, called the Potomac River Sewage Pumping Station, to be located at Point 5. The need for this relief sewer and for the new pumping station and its force main is urgent, not only for Project A but also for Projects B and C. The new sewage pumping station can be built at any suitable location south of K Street. The exact location can best be determined when contract drawings and specifications are about to be prepared, or prior to that time, if necessary or desirable. The location may be dictated by highway use of the area for the proposed Inner Loop Freeway and Constitution Avenue Bridge approaches planned in this vicinity, and it is desirable that these various projects be coordinated.

The proposed relief sewers for the entire Rock Creek Main Interceptor would be 20,760 ft. long, and the sizes would range from 24 to 66 in. in diameter, for Project A. The total estimated cost is $2,470,000.

East Side Interceptor. The existing East Side Interceptor, described briefly on page 21 of the investigative report of June 1955, does not serve any area in Maryland. The tributary area and population as of the year 2000 apply to the District, only, and are given on page 125 of the investigative report, being 8,237 acres and 297,590 population, respectively.

The East Side Interceptor actually serves as an interceptor only from East Capitol Street, where it crosses the existing Northeast Boundary Trunk Sewer, to the outlet at the Main Sewage Pumping Station. Upstream from East Capitol Street, the sewer serves as a separate trunk sewer. The data given herein for the latter or upstream portion, therefore, apply to Projects A, B, and C, since the conversion of combined sewers to separate systems would have no effect here.

The East Side Interceptor is deficient in capacity in Project A through 69 percent of its length, as of the year 2000. The over-all capacity of the deficient portion is approximately 71 percent of the required capacity.

Through a length of 5,100 ft. at the upstream end, the existing interceptor is estimated to have adequate capacity for conditions as of the year 2000. Downstream of this stretch and as far as East Capitol Street, portions of the interceptor have adequate capacity and portions have small deficiencies in capacity. As these deficiencies are not great, it is considered that the existing interceptor will serve without relief throughout the portion upstream of East Capitol Street.

Downstream of East Capitol Street, the existing interceptor is estimated to be materially deficient in capacity throughout, as of the year 2000. Through this stretch, the over-all capacity is approximately 61 percent of the required capacity.

Several spot depth-of-flow measurements have been made in the East Side Interceptor on various dates during recent years, the latest in December 1955. The measurements were made during the middle of the day. The results are summarized as follows, the first five locations being upstream of East Capitol Street:

Location	Approximate range of majority of measurements, in percent of depth full
20th and Otis Streets, N.E.	20 to 22
Mills Ave., just upstream of Franklin St.	18 to 25
Easement just downstream of New York Ave.	25 to 30
Easement a short distance upstream of M St.	25 to 29
Anacostia Park, just upstream of Benning Rd.	26 to 28
M St., just west of 14th St., S.E.	48 to 51

An overflow gage has been maintained for over a year in the Northeast Boundary Trunk Sewer just downstream of the point where its dry-weather flow is intercepted by the East Side Interceptor. This gage shows 57 occurrences of overflow of mixed sewage and stormwater to the Anacostia River in 12 months (Tables 16 and 17, Gage No. 6, Chapter F), with 32 occurrences in the summer months and 25 in the winter. Since none of the overflows occurred in dry weather, the conditions here are not as critical as at certain other locations where such dry-weather overflows have occurred.

It has been concluded that the portion of the East Side Interceptor downstream of East Capitol Street will need relief in the future, and that upstream of East Capitol Street relief probably will not be needed for many years, if ever. The entire tributary area is fairly well developed at the present time, but there is space for additional development.

It is important that the overflow gage in the Northeast Boundary Trunk Sewer be maintained and continued in operation.

As shown on Fig. 14, a relief sewer has been planned for the portion of the East Side Interceptor downstream of East Capitol Street, where it crosses the Northeast Boundary Trunk Sewer, as part of Project A. The proposed relief sewer would start in the vicinity of 21st Street and Constitution Avenue, N.E., where a new sewage pumping station would be required for the relief sewer. From this pumping station, the relief sewer would proceed in a southerly direction, as a force main, crossing the Anacostia River and continuing thence southwesterly to a junction with the existing Outfall Sewers at a point just downstream of the existing Poplar Point Sewage Pumping Station.

In planning the proposed relief sewer, a route along the northwesterly side of the Anacostia River was considered, but it was found that space is very limited and construction

would be expensive, through portions of the route. Furthermore, it was desired to bypass the existing Main Sewage Pumping Station, so as to relieve it as well as the East Side Interceptor. This led to the arrangement of relief sewer and pumping station shown on Fig. 14, with the proposed relief sewer located largely on the southeasterly side of the Anacostia River, where most of it would be located in park property.

As shown on Fig. 14, the W.S.S.D. has constructed a sewer, called the Anacostia River Trunk Sewer, along the Anacostia valley southeasterly of the Anacostia River, extending downstream as far as Blaine Street, where it has a temporary connection to the Anacostia Main Interceptor, with an overflow to the Anacostia River. The W.S.S.D. plans to continue this trunk sewer farther downstream in the near future, to a permanent outlet in the existing Outfall Sewers of the District at a point just downstream of the Poplar Point Sewage Pumping Station. The function of the Anacostia River Trunk Sewer is to convey to the District sewerage system the flow which formerly went to the W.S.S.D. sewage treatment plant at Bladensburg. That treatment plant became inadequate to handle all of the flow reaching it, and has been abandoned.

Since the planned W.S.S.D. Anacostia River Trunk Sewer would be more-or-less parallel to the proposed East Side Interceptor Relief, for a portion of its length, a study was made of the use of a joint sewer serving both purposes. Such a joint sewer would extend from Point 16 to Point 17, on Fig. 14. Comparative preliminary designs and estimates were made, using two individual sewers versus one joint sewer, within the stated limits. The study showed that, under Project A, it would be more economical for both the District and the W.S.S.D. to build and use a joint sewer, than to build two sewers. However, since it is desirable that the W.S.S.D. trunk sewer be completed as soon as possible, to eliminate dry-weather overflows of sewage which are occurring at Blaine Street, and since funds are available for its completion, it is deemed necessary to permit prompt completion of that sewer, rather than to await the raising of funds by the District to help finance a joint sewer. It is understood that this would involve a delay of two years or more. For this reason, primarily, the use of a joint sewer is not recommended. However, it is desirable that the planning of the W.S.S.D. sewer and the proposed East Side Interceptor Relief sewer be co-ordinated, so that the construction of both will be facilitated.

The proposed relief sewer is planned to be located along the northwesterly side of the right-of-way of the proposed Anacostia Freeway, which is expected to be constructed within the near future. Construction in this space is expected to be more economical than construction elsewhere. A study was made with the proposed sewer located within the embankment of the Freeway, since the proposed sewer is a force main through most of its length, with the hydraulic grade line above the present ground surface, but this location was rejected primarily because of the possible danger of washing out the embankment in case of failure or leakage of the sewer. The planning of the W.S.S.D. sewer and the District relief sewer should be co-ordinated with the planning of the Anacostia Freeway.

Attention is directed to the fact that the proposed East Side Interceptor Relief would provide some relief for the Main Sewage Pumping Station and for the Outfall Sewers upstream of Point 17.

The proposed East Side Interceptor Relief, for Project A, would be 17,450 ft. long, with diameters varying from 48 to 60 in., except for the river crossing, which would consist of two 24-in. pipes beneath the river bed. The estimated cost of the pumping station is $873,000 and of the sewer, $2,140,000 giving a total cost of $3,013,000.

Proposed Potomac River Sewage Pumping Station and Force Main. As shown on Fig. 14, for Project A, it has been planned that a new sewage pumping station would be constructed at Point 5, to handle all flow from the Rock Creek Main Interceptor and from certain other areas downstream therefrom, as far as, and including, the Easby Point Sewer District. This station would pump the sewage into a new force main to be constructed from Point 5 to Point 6, where it would discharge into the proposed Outfall Sewer Relief.

The tributary population for the proposed pumping station and force main as estimated by the Board, for Project A, and as of the year 2000, would be 722,600, including 286,000 population for Maryland. The corresponding total net area is estimated to be 33,990 acres, including 22,020 acres in Maryland.

The required capacity of the proposed pumping station and force main would be 354 cfs. or 229 mgd.

Attention is directed to the fact that the proposed Potomac River Pumping Station and Force Main would provide some relief for the Main Sewage Pumping Station and the Outfall Sewers.

The force main would be 22,650 ft. long, with a diameter of 84 in. except for the river and Tidal Basin Inlet crossings, where two 54-in. pipes beneath the streams would be used for each crossing, for Project A, to obtain higher velocities than in the land portions.

The estimated cost of the pumping station is $2,771,000, and of the force main, $4,900,000, giving a total cost of $7,671,000; the overflow structure and miscellaneous connections would cost $50,000 in addition to the other costs given.

Outfall Sewers. The existing Outfall Sewers, which are described briefly on page 22 of the investigative report of June 1955, together with the Oxon Run Trunk Sewer which discharges to the Outfall Sewer just upstream of the sewage treatment plant, serve the entire population and area of the District and the entire tributary Maryland population and area. The total tributary population, as estimated by the Board, and as of the year 2000, is 1,925,000, including 800,000 for Maryland. The total net area is 90,019 acres, including 60,644 acres estimated for Maryland.

The existing Outfall Sewers are deficient in capacity for Project A, throughout the entire length, as of the year 2000. The over-all capacity is 42 percent of the required capacity, before any reliefs are made.

Spot depth-of-flow measurements made in the Outfall Sewer at a point near the southerly line of Bolling Air Force Base, on various dates in 1955 and 1956, showed the depths of flow varying between 78 and 94 percent of the depth full. The measurements were made during the middle of the day. These measurements were made prior to October 29, 1956, on which date the Anacostia Valley Trunk Sewer of the W.S.S.D. was first connected to the District sewerage system, thereby increasing the peak flow in the sewers downstream therefrom by as much as 40 to 50 mgd., it has been estimated. Therefore, the flow in the Outfall Sewers since October 29, 1956, has been considerably greater than it was when the measurements were made.

It has been concluded that the Outfall Sewers will need relief in the very near future, throughout their entire length.

As shown on Fig. 14, a relief sewer has been planned for the existing Outfall Sewers, as part of Project A. The relief sewer would start at Point 17, where the proposed District relief sewer and the W.S.S.D. trunk sewer would join the Outfall Sewers, and would continue to the sewage treatment plant, picking up the proposed Potomac River Force Main at Point 6. There would be an overflow to the Potomac River, in the vicinity of the sewage treatment plant, as indicated on Fig. 14. The portion of the Outfall Sewers upstream of Point 17 would be relieved sufficiently by the proposed Potomac River Force Main and East Side Interceptor Relief.

The length of the proposed relief sewer, from Point 17 to the sewage treatment plant, would be 18,750 ft., and the sizes would be 10 ft. 0 in. and 12 ft. 0 in. semi-elliptical or

equivalent, for Project A. The estimated cost is $7,980,000. The overflow structure would cost an additional $360,000.

Main Sewage Pumping Station. Under Project A, the required capacity of the existing Main Sewage Pumping Station, as of the year 2000, would be reduced by the reliefs from 658 cfs. (425 mgd.) to 259 cfs. (167 mgd.) The latter flow can be handled by any three of the four existing sanitary pumps in this station (Table G-4, investigative report of June 1955), so the station would not require relief under Project A. No relief would be required for the siphons under the Anacostia River.

Rock Creek Sewage Pumping Station. Under Project A, the required capacity of the existing Rock Creek Sewage Pumping Station, as of the year 2000, would be reduced by the Upper Potomac Interceptor Relief from 114.1 cfs. (73.9 mgd.) to 51.1 cfs. (33.0 mgd.). The latter flow is less than the capacity of any two of the three existing pumps in the station (Table G-14, investigative report of June 1955), so no relief would be required.

Summary. A summary of Projects A, B, and C is given in Section 7 of this chapter.

4. Project B

General Description of Project B. Project B, shown on Fig. 15, is based on the conversion of two small combined-sewer areas in the District to separate systems, in addition to the Area Z shown on Fig. 15 as previously having been authorized for conversion. The two small combined-sewer areas are Sewer District E-1 and a portion of Sewer District I-1 (Fig. 2, Chapter A).

Sewer District E-1, located adjacent to Potomac River just downstream of the mouth of Rock Creek, would be converted so that the upstream end of the existing B Street-New Jersey Avenue Trunk Sewer could be used, for a short distance, as a continuation of the Rock Creek Main Interceptor to Point 5. At this point, the flow would be discharged to a proposed sewage pumping station. Also, conversion of this area to a separate system would permit discharge of all stormwater from the area to the adjacent Potomac River by gravity, and this would be more economical than conveying the stormwater a distance of about 3 miles through existing sewers, as now, or through proposed relief sewers, to the Main Sewage Pumping Station, where, at times, it would have to be pumped into the Anacostia River.

The small combined-sewer portion of Sewer District I-1, located southeasterly of Anacostia River a short distance upstream of the Poplar Point Sewage Pumping Station, would be converted to a separate system because it is the only remaining combined-system area on the southeasterly side of the Anacostia River. This conversion would eliminate all overflows of mixed sewage and stormwater on the southeasterly side of the river, and would provide some relief for the existing Anacostia Main Interceptor and Poplar Point Sewage Pumping Station, as well as the existing Outfall Sewers downstream from the Poplar Point Sewage Pumping Station, by making it unnecessary for them to provide capacity for the diluting stormwater from the area converted.

Area Z, mentioned above, located easterly of Washington Channel and in the vicinity of Maine Avenue, comprises parts of Sewer Districts E-3 and E-8 and all of Sewer Districts E-4, E-5, and E-7 (Fig. 2).

Under Project B, an overflow sewer would be built beneath and adjacent to Piney Branch and Rock Creek, from the existing Piney Branch Trunk Sewer outlet west of 16th Street to the Potomac River. This overflow sewer and the existing interceptors and diversion sewers in Rock Creek valley, except the portions along Piney Branch, would be given

a total capacity sufficient to provide for all flows from existing combined sewers in Rock Creek valley, up to the runoff from a storm having an average frequency of once in 2 years. This would provide a dilution factor of approximately 200 for the intercepting-sewer system in Rock Creek valley. A greater dilution factor would apply to Piney Branch, as explained later. However, there would be no discharge to the proposed overflow sewer until a dilution factor of at least 30 is reached, during each storm, in all tributary combined sewers. As a result, flows up to 30 dilutions would be conveyed through sewers now existing or through their proposed reliefs, to a new sewage pumping station to be located some distance downstream from the mouth of Rock Creek (Fig. 15), at Point 5; and flows exceeding 30 dilutions and up to about 200 dilutions would be discharged to the proposed overflow sewer and thence to Potomac River at a point near the mouth of Rock Creek.

Except as outlined above for Rock Creek valley, the intercepting-sewer system under Project B would be designed to provide a dilution factor of 30 where it serves combined systems having overflows to the Potomac River upstream of the proposed sewage pumping station, called the Potomac River Sewage Pumping Station, to be located near the easterly bank of the river at a point downstream from the mouth of Rock Creek, in the vicinity indicated on Fig. 15, at Point 5.

All other interceptors in the District upstream of the vicinity of Hains Point would provide a dilution factor of ten for the remaining tributary combined sewers. These combined sewers include the Easby Point Trunk Sewer and all combined sewers having overflows along the northwesterly bank of the Anacostia River. The dilution factor of ten would prevail as far downstream as the vicinity of Hains Point. Downstream of this vicinity, the dilution factor for the proposed Potomac River Force Main and the Outfall Sewer Relief would be reduced to five, by overflows in the vicinity of Hains Point.

Under this project there would be three overflow conduits for mixed sewage and stormwater from the proposed relief interceptors to the Potomac River. One overflow conduit would be located at the new Potomac River Sewage Pumping Station mentioned above, and the other two would be in the vicinity of Hains Point.

The overflow at the Potomac River Sewage Pumping Station would provide for all flows reaching the station in excess of ten times the estimated yearly average dry-weather flow as of the year 2000. All flow up to an amount equal to ten times the estimated yearly average dry-weather flow for the year 2000 would be pumped at this station into a pressure sewer called the Potomac River Force Main, which would continue in a southerly direction (Fig. 15).

One of the overflows at Hains Point would reduce the dilution factor for the Potomac River Force Main downstream of Hains Point from ten to five (Fig. 15). The other overflow near Hains Point would be located on the easterly bank of the Potomac River, and would reduce the dilution factor for the proposed Outfall Sewer Relief to a value of five downstream of where the Potomac River Force Main joins the Outfall Sewer Relief (Point 6 on Fig. 15).

Under Project B, relief sewers would be needed for the entire Upper Potomac Interceptor, for portions of the Rock Creek Main Interceptor, for the portion of the East Side Interceptor which is downstream of the point where it crosses the Northeast Boundary Trunk Sewer, and for the Outfall Sewers downstream of the Main Sewage Pumping Station, including the siphons under the Anacostia River. The existing West Rock Creek Diversion Sewer would be extended from its present upstream terminus to Connecticut Avenue. In general, the proposed relief sewers for Project B would be in the same locations as those for Project A, previously described.

Two new sewage pumping stations would be required: one near the Potomac River bank southeasterly of the mouth of Rock Creek, and the other near the Northeast Boundary Trunk Sewer downstream of the point where it crosses the East Side Interceptor.

The first new station would handle all flow up to 10 dilutions from Rock Creek valley, including flow from the existing Upper Potomac Interceptor and its proposed relief sewer, as well as the dry-weather flow from Sewer Districts E-1 and E-2, the latter being served by the Easby Point Trunk Sewer (Fig. 2). In addition to the dry-weather flow from Sewer Districts E-1 and E-2, this station would handle the stormwater from areaways and depressed driveways in those districts, as authorized (Fig. 6, Chapter E). Flows in excess of ten dilutions would be overflowed to Potomac River at this pumping station, as explained above.

The other proposed pumping station, at Point 15a on Fig. 15, would handle all dry-weather flow, plus diluting stormwater up to ten dilutions, from the Northeast Boundary Trunk Sewer, and in addition would take all flow from the East Side Interceptor at a point upstream of where it crosses the Northeast Boundary Trunk Sewer.

The proposed relief sewers immediately downstream of the new pumping stations would be force mains for a distance. Downstream of the force mains, the proposed relief sewers would be gravity conduits.

Under this Project B, the existing Main Sewage Pumping Station and the siphons under Anacostia River would require additional capacity, as will be explained later. No additional capacity would be required for the existing Rock Creek Sewage Pumping Station.

Discussion of Dilution Factors Used for Project B. Under Project B, a dilution factor of about 200, equivalent to a 2-year frequency storm, has been used for Rock Creek valley, except the Piney Branch portion, so as to afford Rock Creek what is considered to be the maximum practicable protection, when relative costs are considered.

Piney Branch has been given greater protection than the remainder of Rock Creek valley, under Project B. This is discussed later in this section, under the sideheading, "Rock Creek Overflow Sewer," since it has no influence on the interceptor capacities.

A dilution factor of 30 has been used, under this Project, for interceptors serving combined systems having overflows to the Potomac River upstream of the proposed Potomac River Sewage Pumping Station (Point 5 on Fig. 15). This dilution factor was selected for these interceptors after making alternate designs and cost estimates based on the use of various dilution factors from 7 to 30 for a hypothetical interceptor serving sewer Districts A-8 through A-12, which are located along the upper Potomac River (Fig. 2). A factor of 30 appeared to be the highest justifiable in view of the greater cost of the relief interceptors designed for the higher dilution factors. Use of a fairly high dilution factor is considered desirable in this vicinity because of the possibility of cleaning up the adjacent portion of the river so that it might be suitable for certain recreational uses.

Downstream of the proposed pumping station at Point 5, and as far downstream as Hains Point, and also along the Anacostia River, a dilution factor of ten has been used for Project B, as these portions of the rivers are subject to considerable tidal action and therefore to some sewage pollution from downstream, and this would tend to counteract, if not nullify, the benefit which might otherwise be obtained by the use of a higher dilution factor for interceptor design.

Along the Potomac River downstream of Hains Point, it has been considered that a dilution factor of five is the highest justifiable economically, since the river often is sluggish and is twice daily subject to the upstream movement of polluting material by the

tides. It is not deemed practicable to make this portion of the water area as suitable for recreation as the areas farther upstream.

General Remarks Relating to Existing Intercepting Sewers. The general remarks relating to each of the existing intercepting sewers, their tributary populations and areas, their measured flows, overflows, and the like, as given for various existing sewers, under the center-heading, "3. Project A," above, apply likewise to the same sewers under Project B.

Upper Potomac Interceptor. Under Project B, all conditions relative to relief needed and relief planned for the existing Upper Potomac Interceptor from Point 1 to Point 3, Fig. 15, are identical to the corresponding conditions as given for this sewer for Project A, under the center-heading, "3. Project A," above. Point 3 is at Glover-Archbold Parkway, where the first combined sewer would be encountered, in progressing downstream. This is the Foundry Branch Trunk Sewer. Only from Point 3 to Point 4 does Project B differ from Project A.

Within the limits named (from Point 3 to Point 4), the Upper Potomac Interceptor serves existing combined sewers which are not planned to be converted to separate systems under Project B, and a dilution factor of 30 has been used for computation of the needed interceptor capacity under Project B, as stated above. This results in considerably greater required capacities before relief, and therefore greater deficiencies in capacity, for this portion of the interceptor, than under Project A. This portion of the existing interceptor has an over-all capacity equal to about 20 percent of the required capacity under Project B, as of the year 2000.

Although a dilution factor of 30 has been used for the intercepting capacity applicable to the existing combined systems served by this interceptor, the actual dilution factor for the flow in the proposed relief interceptor would be only 11.7 near the downstream end (Fig. 15), as explained in Section 2 of this chapter, under the sideheading, "Matters Relating to All Projects." This results from the large dry-weather flow discharged from the tributary separate systems upstream of Point 3. However, as indicated, the overflow of mixed sewage and stormwater from each combined sewer to the Potomac River would not occur until a dilution factor of 30 is reached in that sewer.

The proposed Upper Potomac Interceptor Relief would be 23,990 ft. long and would vary in diameter from 48 to 96 in., for Project B. The estimated cost is $3,950,000. (Comparable cost data for Projects A, B, and C are given later in this chapter, in Table 23, in summarizing the alternate projects.)

Rock Creek Main Interceptor. Under Project B, all conditions relative to relief needed and relief planned for the existing Rock Creek Main Interceptor from Point 9 to Point 13a, Fig. 15, are identical to the corresponding conditions as given for this sewer for Project A, under the center heading, "3. Project A," above, with one minor exception, which will be explained. Point 13a is at Connecticut Avenue, where the first combined sewer is encountered, in progressing downstream. This is based on considering the Klingle Road Sewer District (C-18) as a separate-system area, as the Board has done in making hydraulic and interceptor-design computations.

The minor exception mentioned in the preceding paragraph relates to the relief planned downstream of Point 13. The amount of the relief varies slightly as between Projects A and B, due to relief conditions downstream, and the proposed relief sewer for Project B continues farther downstream and discharges to the existing Rock Creek Main Interceptor near P Street, at Point 14a (Fig. 15), rather than discharging to the existing East Rock Creek Diversion Sewer at Point 14, as for Project A.

Downstream of Point 13a, the existing Rock Creek Main Interceptor now serves existing combined sewers which are not planned to be converted to separate systems under Project B. In this area, a dilution factor of 30 has been used for computation of the needed interceptor capacity under Project B.

Through this downstream portion, the required capacities for the Rock Creek Main Interceptor before relief, and therefore the deficiencies in capacity, are greater than under Project A. This portion of the existing interceptor has an over-all capacity equal to about 42 percent of the required capacity under Project B, as of the year 2000.

The proposed relief sewers for the entire Rock Creek Main Interceptor would be 30,850 ft. long, and would vary in size from 24 in. to 14 ft. 0 in., for Project B. The estimated cost is $6,890,000.

Proposed West Rock Creek Diversion Sewer Extension. Some relief of the Rock Creek Main Interceptor would be provided, under Project B, by extending the existing West Rock Creek Diversion Sewer from its present upstream terminus to Connecticut Avenue, as originally planned when the diversion sewer was built, and by picking up the flow from the combined sewers intercepted on the westerly side of Rock Creek, up to a dilution factor of 30.

This sewer would be 1,870 ft. long, and the sizes would be 24 and 27 in. The estimated cost is $140,000.

Proposed Piney Branch and Rock Creek Overflow Sewer. For all combined sewers in Rock Creek valley, except those overflowing to Piney Branch, the flow in excess of a dilution factor of 30 and up to a factor of about 200 (for a rainstorm of 2-year frequency) would be discharged to a proposed overflow sewer located beneath and along Rock Creek, whence it would be conveyed to the Potomac River, under Project B.

Greater provision should be made to reduce the overflows from combined sewers to Piney Branch than from those having overflows to Rock Creek, since the branch is dry ordinarily, since aesthetic considerations appear to require more protection here, and since overflows might cause damage to an open stream bed.

To improve conditions in Piney Branch it is proposed to build an enclosed conduit or a stone-lined open channel along Piney Branch from the existing overflow and diversion structure just west of 16th Street to Rock Creek. If the enclosed conduit is built, it would be necessary to build a shallow open channel above the conduit to collect the runoff from the adjacent hillsides and roadway and to carry infrequent overflows from the overflow and diversion structure which exceed the capacity of the proposed conduit and the existing East Rock Creek Diversion Sewer. Such an open channel could be grassed and its banks suitably landscaped.

It has been estimated that the overflow capacity (to Piney Branch) of the existing overflow and diversion structure is 4,600 cfs., when just filled. Since the existing East Rock Creek Diversion Sewer has a capacity of 1,200 cfs. at this point, the total of 1,200 cfs. diverted plus 4,600 cfs. overflow would give 5,800 cfs. as the total capacity of the existing structure without surcharging the tributary sewers upstream. This is approximately equal to the computed runoff from a storm of 60-year frequency, for the year 2000. Therefore, the proposed conduit or stone-lined open channel along Piney Branch would be given a capacity such that its capacity and that of the East Rock Creek Diversion Sewer, would provide for a 60-year storm. If the conduit is built, no overflow to the future Piney Branch stream bed over the conduit would occur until the capacity of the existing overflow and diversion structure is reached. Use of the 60-year frequency is equivalent to a dilution factor of about 375, for conditions as of the year 2000.

A study was made of using the enclosed conduit or the stone-lined concrete open channel along Piney Branch. The enclosed conduit is preferred, although the cost is somewhat greater than for an open channel, partly for aesthetic and sanitary reasons and partly because it would be safer for children than an open channel. The enclosed conduit would eliminate the danger of their being swept into the underground conduit planned to be constructed along Rock Creek, as might happen if they should accidentally fall into the open channel when there is flow in it.

At the mouth of Piney Branch, an overflow to Rock Creek would be provided for all flow in the proposed conduit exceeding that from a storm of 2-year frequency. The runoff up to that from a 2-year storm would continue in the Rock Creek Overflow Sewer to Potomac River.

In connection with the proposed conduit along Rock Creek, consideration has been given to alternate plans which would avoid locating the conduit beneath the creek. A location immediately adjacent to the creek was studied, as well as plans to build the conduit in tunnel for long stretches or even for the entire length. These alternate plans were rejected in favor of locating the conduit beneath the creek bed, except for two short stretches where the ridges formed by long loops in the creek would be tunnelled along short cutoff lines, and except near the outlet, where the conduit would depart from the creek channel. The alternate plans in the valley of Rock Creek but not beneath the stream bed would have interfered seriously with traffic, would have required deeper excavation, and would have been more costly than the plan of locating the conduit beneath the creek bed. The approximate proposed location is shown on Fig. 15 and Plate 1.

It was concluded that the location beneath the creek bed would cause the least damage to the park and the least obstruction to traffic, and would be the most economical to construct. Certain precautions would be necessary in the design and construction, such as watertight construction joints, cutoff walls extending from the sewer barrel to the side of the excavation at short intervals, careful backfilling, and the like, to restore and maintain the low flows in Rock Creek after completion of the conduit. The creek bed and banks should be restored to a natural appearance as rapidly as possible after the principal construction work has been completed.

The conduit along Piney Branch would be 2,600 ft. long, the sizes being 22 ft. 0 in. by 12 ft. 0 in. and 20 ft. 0 in. by 11 ft. 0 in., both semi-circular or equivalent. Its estimated cost is $1,470,000.

The conduit along Rock Creek would be 18,480 ft. long, with a twin section having two rectangular barrels, each 10 ft. 0 in. by 10 ft. 0 in. in inside dimensions, except at the tunnels, where the section would be 14 ft. 0 in. in diameter or equivalent. The estimated cost is $12,490,000.

The estimated cost of the entire conduit is $13,960,000.

East Side Interceptor. Under Project B, Fig. 15, all conditions relative to relief needed for the existing East Side Interceptor upstream of Point 15 are identical to the corresponding conditions as given for this sewer for Project A, under the center heading, "3. Project A," above. Point 15 is at East Capitol Street, where the first combined sewer (Northeast Boundary Trunk Sewer) is encountered, in progressing downstream.

The entire relief sewer planned for this interceptor under Project B is different from that planned for Project A. Within the area downstream of Point 15, the East Side Interceptor serves existing combined sewers which are not planned to be converted to separate systems under Project B, and a dilution factor of ten has been used for computation of the needed intercepting capacity under Project B, as stated above. This results in considerably

greater required capacities before relief, and therefore greater deficiencies in capacity, for this portion of the interceptor, than under Project A. This portion of the interceptor has an over-all capacity equal to about 18 percent of the required capacity under Project B, as of the year 2000.

Although a dilution factor of ten has been used for the intercepting capacity applicable to the existing combined systems served by this interceptor, the actual dilution factor for the flow in the proposed relief interceptor would be only 8.3. This results from the large dry-weather flows discharged by the East Side Interceptor upstream of Point 15, where it is really a separate trunk sewer. An example of the reduction in dilution factor by tributary separate systems has been given in Section 2 of this chapter, under the sideheading, "Matters Relating to All Projects." However, as indicated, the overflow of mixed sewage and stormwater from each combined sewer to the Anacostia River would not occur until a dilution factor of ten is reached in that sewer.

As for Project A, a study was made of the use of a joint sewer for W.S.S.D. and the District, for a portion of the line, but the joint sewer was rejected, for the same reason as previously given for its rejection in Project A.

Attention is directed to the fact that the proposed East Side Interceptor Relief would provide some relief for the Main Sewage Pumping Station and the Outfall Sewers.

The proposed East Side Interceptor Relief, for Project B, would be 17,450 ft. long, and the sizes would vary from 54 in. to 10 ft. 6 in., except for the river crossing, which would consist of two 60-in. sewers beneath the river bed. The estimated cost of the pumping station is $2,923,000, and of the sewer, $4,780,000, giving a total cost of $7,703,000.

Proposed Potomac River Sewage Pumping Station and Force Main. As stated above, this proposed pumping station would pump a flow equal to a dilution factor of ten into the proposed force main, for Project B. The required capacity would be 1,520 cfs. (983 mgd.).

At Hains Point, an overflow to the Potomac River would be provided for one-half of the required flow, thus reducing the dilution factor for the force main downstream from ten to five.

Attention is directed to the fact that the proposed pumping station and force main would provide considerable relief for the Main Sewage Pumping Station and the Outfall Sewers.

The force main would be 22,670 ft. long, from Point 5 to 6. It could be built of two parallel pipelines, either for the whole distance or for a part. While this would cost considerably more than a single pipeline, such a plan would have the advantage that, in case of trouble with one line, that line could be taken out of service without interrupting the flow of sewage in the other one. This is an advantage, as otherwise the excess flow which could not be carried by other sewers would have to be diverted into the Potomac River while repairs are being made.

The tidal basin inlet and river crossings would each be built of pipes having reduced diameters to obtain higher velocities of flow than in the land portions.

The estimated cost of the pumping station is $6,830,000, and of the force main, $15,780,000, based on using a single pipeline except for the subaqueous portion, giving a total cost of $22,610,000. Overflow structures and miscellaneous connections would cost $797,000 in addition to the other costs given.

Outfall Sewers. After certain proposed upstream reliefs for Project B are made, namely, those provided by the Potomac River Pumping Station and Force Main, and the

East Side Interceptor Relief, the existing Outfall Sewers still would be unable to handle the remaining required quantity. They would be greatly deficient for Project B throughout their entire length.

The Outfall Sewer Relief under Project B would start at the existing Main Sewage Pumping Station and thence would continue to the sewage treatment plant, as shown on Fig. 15.

The required capacity would be that necessary to obtain a dilution factor of ten at the Main Sewage Pumping Station, and five downstream of Point 6, at which point another overflow to the Potomac River would be provided.

The length of the proposed Outfall Sewer Relief, from Point 17a to 8, would be 22,900 ft., and the sizes would be 13 ft. 6 in. and 18 ft. 0 in., for Project B. The estimated cost is $27,550,000, plus $2,281,000 for overflow structures.

Main Sewage Pumping Station. In accordance with the information given above, the existing Main Sewage Pumping Station under Project B would need additional capacity. The required total capacity for the station by the year 2000 would be 559 mgd., for the sanitary pumps. Based on a capacity of 225 mgd. for the four existing sanitary pumps (Table G-4, investigative report of June 1955), the needed added capacity would be 334 mgd., for Project B. The additional capacity would be provided in the existing station or in a new supplementary station. The estimated cost is $3,061,000.

Rock Creek Sewage Pumping Station. Under Project B, the required capacity of the existing Rock Creek Sewage Pumping Station, as of the year 2000, would be reduced by the Upper Potomac Interceptor Relief from 423 cfs. (274 mgd.) to 62 cfs. (40 mgd.). The latter flow could be handled by any two of the three existing pumps in the station (Table G-14, investigative report of June 1955), so no relief would be required.

Summary. A summary of Projects A, B, and C is given in Section 7 of this chapter.

5. Project C

General Description of Project C. Project C, shown on Fig. 16, is based on the conversion of three combined-sewer areas in the District to separate systems, in addition to Area Z shown on Fig. 16 as previously having been authorized for conversion, by the District. Two of the areas to be converted comprise Sewer District E-1 and a portion of Sewer District I-1 (Fig. 2, Chapter A), which are the same areas as those previously described in Section 4, above, for conversion under Project B. The reasons for converting these areas are given in discussing Project B, in Section 4.

The third area which would be converted under Project C is a large area in, and adjacent to, the Foundry Branch and College Pond sections of the Upper Potomac Interceptor area, located upstream of Key Bridge, as shown on Fig. 16. This area consists of the combined-sewer portion of Sewer District A-8, and all of Sewer Districts A-9 and A-10 (Fig. 2). The purpose of converting this area to a separate system is to eliminate the overflow of sewage and stormwater from much of the upper Potomac River, to improve the condition of this stretch of the river.

Area Z, mentioned above, located easterly of Washington Channel and in the vicinity of Maine Avenue, comprises parts of Sewer Districts E-3 and E-8 and all of Sewer Districts E-4, E-5, and E-7, shown on Fig. 2.

Under Project C, an overflow sewer would be built beneath and adjacent to Piney Branch and Rock Creek, from the existing Piney Branch Trunk Sewer overflow and diversion structure just west of 16th Street to the Potomac River. This overflow sewer would be identical to the one included in Project B, as described above in Section 4 of this chapter.

Under this Project C, the intercepting sewers serving Sewer Districts A-11 and A-12, and the intercepting sewer serving the East and West Rock Creek Diversion Sewers would be designed to provide a dilution factor of 30, as far downstream as the proposed Potomac River Sewage Pumping Station. Sewer Districts A-11 and A-12 are located in Georgetown along the Potomac River just upstream of Rock Creek, as shown on Fig. 2.

All other interceptors in the District, except those mentioned in the preceding paragraph and except those in Rock Creek valley, would provide a dilution factor of five for the remaining tributary combined sewers. These combined sewers include Easby Point Trunk Sewer and all combined sewers having overflows along the northwesterly bank of the Anacostia River.

Under this project there would be only one overflow of mixed sewage and stormwater from the proposed relief interceptors to the Potomac River. This overflow would be located at the proposed Potomac River Sewage Pumping Station mentioned above, at Point 5 on Fig. 16. The overflow would take all flows reaching the Potomac River Sewage Pumping Station in excess of five times the estimated yearly average dry-weather flow as of the year 2000. All flow up to an amount equal to five times the estimated yearly average dry-weather flow for the year 2000 would be pumped at this station into a pressure sewer called the Potomac River Force Main, which would continue in a southerly direction, as shown on Fig. 16.

It is contemplated that provisions would be made, under Project C, so that the capacity of the Potomac River Sewage Pumping Station and the Potomac River Force Main could be increased at any future date, by certain additional construction work, if it should ever prove desirable to increase the dilution factor downstream of this station from five to a value somewhat higher.

Under this Project C, relief sewers would be needed for the entire Upper Potomac Interceptor, for portions of the Rock Creek Main Interceptor, for the portion of the East Side Interceptor which is downstream of the point where it crosses the Northeast Boundary Trunk Sewer, and for the Outfall Sewers downstream of the Main Sewage Pumping Station, including the siphons under the Anacostia River. The existing West Rock Creek Diversion Sewer would be extended from its present upstream terminus to Connecticut Avenue. In general, the proposed relief sewers for Project C would be in the same locations as those for Projects A and B, previously described.

Two new sewage pumping stations would be required: one near the Potomac River bank southeasterly of the mouth of Rock Creek, and the other near the Northeast Boundary Trunk Sewer downstream of the point where it crosses the East Side Interceptor.

The first proposed station would handle all flow up to 5 dilutions from Rock Creek valley, including flow from the existing Upper Potomac Interceptor and its proposed relief sewer, as well as the dry-weather flow from Sewer Districts E-1 and E-2, the latter being served by the Easby Point Trunk Sewer (Fig. 2). In addition to the dry-weather flow from Sewer Districts E-1 and E-2, this station would handle the stormwater from areaways and depressed driveways in these districts, as authorized and as shown on Fig. 6, Chapter E. Flows in excess of five dilutions would be overflowed to the Potomac River at this pumping station, as explained above.

The other proposed pumping station, to be located at Point 15 on Fig. 16, would handle all dry-weather flow, plus diluting stormwater up to five dilutions, from the Northeast Boundary Trunk Sewer.

The proposed relief sewers immediately downstream of the new pumping stations would be force mains for a distance. Downstream of the force mains, the proposed relief sewers would be gravity conduits.

Under this Project C, the existing Main Sewage Pumping Station would require additional capacity, as will be explained later. No additional capacity would be required for the existing Rock Creek Sewage Pumping Station.

Discussion of Dilution Factors Used for Project C. Under Project C, as for Project B, a dilution factor of about 200, equivalent to a 2-year frequency storm, has been used for Rock Creek Valley, excepting the Piney Branch portion, so as to afford Rock Creek what is considered to be the maximum practicable protection, when relative costs are considered.

Piney Branch has been given greater protection than the remainder of Rock Creek valley, to the same extent as under Project B, and as described in Section 4, above.

A dilution factor of 30 has been used, under this Project C, for interceptors serving combined systems having overflows to the Potomac River upstream of the proposed Potomac River Sewage Pumping Station (Point 5 on Fig. 16), as for Project B. In the case of Project C, the dilution factor of 30 applies only to Sewer Districts A-11 and A-12, located in Georgetown, and to the interceptor serving the existing East and West Rock Creek Diversion Sewers. This dilution factor was selected for these interceptors after making alternate designs and cost estimates based on the use of various dilution factors from 7 to 30 for a hypothetical interceptor serving Sewer Districts A-8 through A-12, which are located along the upper Potomac River (Fig. 2). A factor of 30 appeared to be the highest justifiable in view of the greater cost of the relief interceptors designed for the higher dilution factors. Use of a fairly high dilution factor is considered desirable in this vicinity because of the possibility of cleaning up the adjacent portion of the river so that it might be suitable for certain recreational uses.

For interceptors serving combined sewers which have overflows to the Potomac River downstream of the proposed pumping station at Point 5, and for those serving combined sewers which have overflows to the Anacostia River, a dilution factor of five has been used for Project C, as these portions of the rivers are subject to considerable tidal action and therefore to some sewage pollution from downstream, and this would tend to counteract, if not nullify, the benefit which might otherwise be obtained by the use of a higher dilution factor for interceptor design.

Along the Potomac River downstream of Point 5 and along the Anacostia River, it is considered that for Project C a dilution factor of five is the highest that is justifiable economically, since the rivers in these areas are often sluggish and are twice daily subject to the upstream movement of polluting material by the tides. It is not deemed economically practicable to make this portion of the water area as suitable for recreation as the area along the Potomac River farther upstream.

However, as stated above, provisions could be made, under Project C, for increasing the dilution factor along the Potomac River downstream of Point 5, by certain construction work, if future experience ever indicates that such a revision is desirable.

General Remarks Relating to Existing Intercepting Sewers. The general remarks relating to each of the existing intercepting sewers, their tributary populations and areas, their measured flows, overflows, and the like, as given for various existing sewers, under

the center-heading, "3. Project A," above, apply likewise to the same sewers under Project C.

Upper Potomac Interceptor. Under Project C, all conditions relative to relief needed and relief planned for the existing Upper Potomac Interceptor from Point 1 to Point 3b, Fig. 16, are identical, or practically identical, to the corresponding conditions as given for this sewer for Project A, under the center-heading, "3. Project A," above. Point 3b is at Potomac Street, where the first combined sewer (Georgetown Sewer) would be encountered, in progressing downstream, since the existing combined-sewer districts upstream of this point would be converted to separate systems under Project C. Only from Point 3b to Point 4 does Project C differ from Project A, for this interceptor.

Within the limits named (from Point 3b to Point 4), the Upper Potomac Interceptor serves existing combined sewers which are not planned to be converted to separate systems under Project C, and a dilution factor of 30 has been used for computation of the needed intercepting capacity under Project C, as stated above. This results in considerably greater required capacities before relief, and therefore greater deficiencies in capacity, for this portion of the interceptor, than under Project A, and smaller required capacities than under Project B. This portion of the existing interceptor has an over-all capacity equal to about 48 percent of the required capacity under Project C, as of the year 2000.

Although a dilution factor of 30 has been used for the intercepting capacity applicable to the existing combined systems served by this interceptor, the actual dilution factor for the flow in the proposed relief interceptor would be only 4.1 near the downstream end, as shown on Fig. 16. This results from the large dry-weather flow discharged from the tributary separate systems upstream of Point 3b. However, as indicated, the overflow of mixed sewage and stormwater from each combined sewer to the Potomac River would not occur until a dilution factor of 30 is reached in that sewer.

The proposed Upper Potomac Interceptor Relief would be 23,990 ft. long and would vary in diameter from 48 to 66 in., for Project C. The estimated cost is $2,780,000.

Rock Creek Main Interceptor. Under Project C, all conditions relative to relief needed and relief planned for the existing Rock Creek Main Interceptor upstream of K Street (Point 4, Fig. 16), are identical, or practically identical, to the corresponding conditions as given for this sewer for Project B, under the center-heading, "4. Project B," above.

Downstream of K Street (Point 4), where the Upper Potomac Interceptor is tributary, somewhat less relief would be required for the Rock Creek Main Interceptor under Project C than under Project B, as a result of a reduction of the combined-sewer area tributary to the Upper Potomac Interceptor, for Project C. This would reduce the allowance needed in both interceptors for diluting stormwater, which otherwise would come from the area planned to be converted to a separate system.

The reduced amount of relief would permit a reduction in the size of the proposed relief sewer between K Street (Point 4) and the proposed Potomac River Sewage Pumping Station (Point 5), as compared with Project B.

Attention is directed to the fact that Figs. 15 and 16 show two proposed relief lines from Point 4 to Point 5, one called "high-level" and the other "low-level." Preliminary study indicates that such an arrangement would be economically desirable, because of the comparatively large differences in elevation among the sewers being relieved. However, a detailed study should be made when contract drawings are about to be prepared, to determine the best arrangement of relief sewers in this vicinity. Also, at that time the exact location of the proposed Potomac River Sewage Pumping Station should be determined, and this would have some influence on the interceptor design.

The proposed relief sewers for the entire Rock Creek Main Interceptor would be 30,850 ft. long, and would vary in size from 24 in. to 12 ft. 0 in., for Project C. The estimated cost is $6,820,000.

Proposed West Rock Creek Diversion Sewer Extension. This extension would be the same under Project C as for Project B, previously described.

Proposed Piney Branch and Rock Creek Overflow Sewer. This sewer would be the same under Project C as for Project B, previously described.

East Side Interceptor. Under Project C, all conditions relative to relief needed for the existing East Side Interceptor upstream of Point 15, Fig. 16, are identical to the corresponding conditions previously given for this sewer in discussing Projects A and B. Point 15 is at East Capitol Street, where the first combined sewer (Northeast Boundary Trunk Sewer) is encountered, in progressing downstream.

The entire relief sewer planned for Project C is different from that planned for Project A or Project B. Within the area downstream of Point 15, a dilution factor of five has been used for Project C, as stated above, whereas a factor of ten was used for Project B, this being the principal difference between the two projects. This, of course, results in smaller required capacities for the existing interceptor before relief and therefore in smaller deficiencies of capacity, for Project C as compared with Project B. The portion of the existing interceptor downstream of East Capitol Street has an over-all capacity equal to about 52 percent of the required capacity under Project C, as of the year 2000, the entire line being deficient in capacity.

Under Project C, the entire relief of the East Side Interceptor would be made by taking the dry-weather flow of the Northeast Boundary Trunk Sewer, plus diluting storm-water, as this would provide the needed relief for the interceptor.

As under Projects A and B, a study was made of using a joint District-W.S.S.D. relief and trunk sewer under Project C, and the joint sewer was rejected for the same reason as previously given for its rejection in Project A.

Attention is directed to the fact that the proposed East Side Interceptor Relief would provide some relief for the Main Sewage Pumping Station and the Outfall Sewers.

The East Side Interceptor Relief, for Project C, would be 15,100 ft. long, with diameters of 66 and 90 in., except for the river crossing, which would consist of two 42-in. pipes beneath the river bed. The estimated cost of the pumping station is $1,645,000, and of the sewers, $2,920,000, giving a total cost of $4,565,000.

Proposed Potomac River Sewage Pumping Station and Force Main. As stated above, this proposed pumping station would pump a flow equal to a dilution factor of five into the proposed force main, for Project C. The required capacity would be 760 cfs. (492 mgd.).

Attention is directed to the fact that the proposed pumping station and force main would provide considerable relief for the Main Sewage Pumping Station and the Outfall Sewers.

The force main would be 22,670 ft. long, and, as in the case of Project B, it could be built of two parallel pipelines, if desired. If built of only one pipeline, it would be 10 ft. 0 in. in diameter.

River and tidal-basin inlet crossings would be built of reduced-size, multiple pipelines, to obtain higher velocities of flow than in the land portions.

The estimated cost of the pumping station is $4,136,000 and of the force main, $8,670,000, for Project C, based on using one pipeline except for subaqueous lines, giving a total cost of $12,806,000. The overflow structure and miscellaneous connections would cost $1,000,000 in addition to the other costs given.

Outfall Sewers. After certain proposed upstream reliefs for Project C are made, namely, those provided by the Potomac River Sewage Pumping Station and Force Main, and the East Side Interceptor Relief, the existing Outfall Sewers still would be unable to handle the remaining required quantity under Project C. They would be greatly deficient throughout their entire length.

The relief sewer would start at the Main Sewage Pumping Station and thence would continue to the sewage treatment plant (Fig. 16).

The required capacity would be such that a dilution factor of five would be provided at the Main Sewage Pumping Station. As the relief sewer progresses downstream, the dilution factor would be reduced as the result of the addition of flow from separate systems, with an extreme low value of 4.3 in one stretch (Fig. 16).

The Outfall Sewer Relief, from Point 17a to Point 8, would be 22,900 ft. long, and the sizes would range from 9 ft. 0 in. to 17 ft. 0 in., except for the river crossing, which would be 54 in. in diameter, for Project C. The estimated cost is $15,360,000, plus $1,700,000 for the overflow structure.

Main Sewage Pumping Station. In accordance with the information given above, the existing Main Sewage Pumping Station under Project C would need additional capacity. The required total capacity for the station by the year 2000 would be 332 mgd., for the sanitary pumps. Based on a capacity of 225 mgd. for the four existing sanitary pumps (Table G-4, investigative report of June 1955), the needed additional capacity would be 107 mgd., for Project C. The additional capacity would be provided in the existing station or in a new supplementary station. The estimated cost is $1,329,000.

Rock Creek Sewage Pumping Station. Under Project C, the required capacity of the existing Rock Creek Sewage Pumping Station, as of the year 2000, would be reduced by the Upper Potomac Interceptor Relief from 218 cfs. (141 mgd.) to 66.6 cfs. (42.5 mgd.). The latter flow could be handled by any two of the three existing pumps in the station (Table G-14, investigative report of June 1955), so no relief would be required.

Summary. A summary of Projects A, B, and C is given in Section 7 of this chapter.

6. Modifications of Projects A, B, and C

Several modifications of Projects A, B, and C were studied by the Board, as follows:

Proposed Rock Creek Overflow Sewer. Under Projects B and C the use of an overflow conduit along Rock Creek based on a rainstorm of 5-year frequency was studied, as an alternate to the conduit for a 2-year frequency storm. Such a conduit would be a twin section having two rectangular barrels, each 13 ft. 0 in. by 10 ft. 0 in. in inside dimensions, except at tunnels, where a 15-ft. 0-in. circular section or equivalent could be used. The estimated cost of this conduit is $17,018,000.

The use of the larger conduit is not recommended, as it is not deemed objectionable to have overflows of mixed sewage and stormwater to Rock Creek occur only once every two years, on the average. However, this alternate plan might be considered further, in the light of conditions then prevailing, when contract drawings for the work are about to be prepared.

Use of Larger Dilution Factors for Project B. Study was made of using a dilution factor of 30 for a modified Project B, without any overflows to the streams except at the sewage treatment plant. This gave such large flows for the needed relief sewers, some as high as 5,500 cfs., and such large capacities for needed pumping stations, up to 1,100 mgd., that the cost was considered prohibitive and the project unreasonable.

Modifying the above plan by means of overflows in the vicinity of Hains Point still made the project appear unreasonable and too expensive, so the use of the high dilution factor throughout was rejected.

Converting Entire Rock Creek Valley to Separate System. A plan was studied whereby all combined sewers in, and adjacent to, Rock Creek valley would be converted to separate systems, while interceptors providing a dilution factor of ten would be constructed along the Anacostia River. No overflows to the streams were planned, except at the sewage treatment plant. The high estimated cost of this plan caused it to be rejected.

7. Summary of Projects A, B, and C

Required Capacities. Table 22 gives a summary of the required capacities at certain locations for the various relief sewers and other structures of Projects A, B, and C. This affords a comparison of the magnitude of the work of the various projects, from a hydraulic standpoint.

Estimated Construction Costs. Tables 23, 24, and 25 give summaries of the estimated construction costs for the works needed under Projects A, B, and C.

Table 25 shows that Projects B and C would each cost considerably less than Project A, and that Project C would have the lowest cost.

Estimated Annual Costs. The estimated annual costs for operation and for debt service for Projects A, B, and C are given in Table 26. The annual costs of maintenance and repair of the sewers and force mains are not included in the table because such costs, in addition to those of the existing sewer system, are not easily estimated and are not large enough to have an important bearing on the relative advantages of one project over another. Such costs would be considerably greater for Project A than for Projects B and C.

The estimated annual costs of operation of the proposed sewage pumping stations in each of the three projects are given in Table 26. Labor costs have been estimated at the rate of $4,500 per year per employee. Pumping costs have been estimated on bases comparable with those experienced in the operation of the existing sewage pumping stations. Maintenance, repairs, and supplies have been taken as 1 percent of the construction cost of the pumping stations.

As shown in Table 26, the total annual cost for Project A would be considerably greater than for either Project B or Project C, when the debt service costs are included. Project C would have the lowest total annual cost.

The annual operating costs for the pumping stations would be the lowest for Project A, and the highest for Project B, as shown in the table. The annual operating costs for the sewers would be the highest for Project A, but these costs are not given in the table.

Table 22. Summary of Required Capacities at Certain Locations, Projects A, B, and C

Name of sewer	Location, Point No.[1]	Required capacity, in cfs., Project: A	B	C
(1)	(2)	(3)	(4)	(5)
SEWERS				
Upper Potomac Interceptor Relief	2 to 3	56	56	56
	3 to 3a	63	213	67.7
	3b to 4	63	308	98.4
Rock Creek Main Interceptor Relief	9 to 9a	62.1	62.1	62.1
	13 to 14[2]	88	86	86
	4 to 5	163	1,694[3]	1,489[3]
East Side Interceptor Relief	15[4] to 16	71	486	212
	16 to 17	71	486	212
Potomac River Force Main	5 to 6[5]	354	1,520	760
Outfall Sewer Relief	17b to 17c	0	665	314
	17 to 6	218	1,266	640
	7 to 8	589	1,595	1,453
	Total[6]	1,008	2,060	1,901
Piney Branch and Rock Creek Overflow Sewer (Piney Branch portion)	Upstr. end	0	4,600	4,600
	Downstr. end	0	4,766	4,766
Piney Branch and Rock Creek Overflow Sewer (Rock Creek portion)	Upstr. end	0	1,875	1,875
	Downstr. end	0	1,962	1,962
OVERFLOW STRUCTURES FROM INTERCEPTORS TO STREAMS				
Mouth of Piney Branch	--	0	2,891	2,891
Potomac River Pumping Station	5	0	481	980
	5a	0	760	0
Outfall Sewer Relief	6	0	485	0
	8	114	1,166	1,007
PUMPING STATIONS				
Potomac River	5	354	1,520	760
East Side Interceptor	15[4]	71	486	212
Main Sewage	17a	0[7]	517[7]	166[7]

1. As shown on Figs. 14, 15, and 16.
2. Or 14a.
3. Total of high-level and low-level reliefs.
4. Or 15a.
5. Or 5a.
6. Entire flow from District and W.S.S.D., all sewers.
7. Added capacity, in addition to that of existing pumps.

Table 23. Estimated Construction Costs of Proposed Reliefs for Intercepting Sewer System, Projects A, B, and C

Item	Location, Point No.[1]	Estimated construction cost,[2] Project: A	B	C
(1)	(2)	(3)	(4)	(5)
Upper Potomac Interceptor Relief	(1 to 3	$ 1,520,000	$ 1,520,000	$ 1,520,000
	(3 to 4	1,180,000	2,430,000	1,260,000
Rock Creek Main Interceptor Relief	(9 to 12c	1,520,000	1,520,000	1,520,000
	(13 to 14[3]	210,000	1,340,000	1,340,000
	(4 to 5	740,000	4,030,000	3,960,000
Potomac River Sewage Pumping Station	5	2,771,000	6,830,000	4,136,000
Potomac River Force Main	5 to 6	4,900,000	15,780,000	8,670,000
East Side Interceptor Relief Sewage Pumping Station	15 or 15a	873,000	2,923,000	1,645,000
East Side Interceptor Relief	(15 to 16	690,000	1,070,000	540,000
	(16 to 17	1,450,000	3,710,000	2,380,000
Outfall Sewer Relief	(17a to 17	0	2,190,000	1,100,000
	(17 to 6	2,230,000	6,530,000	3,860,000
	(6 to 8	5,750,000	18,830,000	10,400,000
Main Sewage Pumping Station[4]	17a	0	3,061,000	1,329,000
Overflows from interceptors to streams	(5	50,000[5]	516,000[5]	1,000,000[5]
	(5a	0	281,000	0
	(6	0	281,000	0
	(8	360,000	2,000,000	1,700,000
West Rock Creek Diversion Sewer Extension	13a to 13c	0	140,000	140,000
Piney Branch and Rock Creek Overflow Sewer	(Piney Branch	0	1,470,000	1,470,000
	(Rock Creek	0	12,490,000	12,490,000
Total		$24,244,000	$88,942,000	$60,460,000

1. As shown on Figs. 14, 15, and 16, and on Plate 1.
2. Based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering. Also, includes local intercepting connections, etc. The costs include, in some cases, work needed to provide for sewage from Maryland (W.S.S.D.) as well as for D.C.
3. Or 14a.
4. Addition to capacity of existing station, or construction of a new supplementary station.
5. Includes emergency overflow, and connection for existing Rock Creek Main Interceptor and Easby Point Trunk Sewer.

Table 24. Estimated Construction Costs of Converting Combined Systems to Separate Systems, Projects A, B, and C

Combined sewer district		Estimated cost[1] of converting to separate system, Project:		
No.	Name of sewer	A	B	C
(1)	(2)	(3)	(4)	(5)
A-8, -9, -10	Upper Potomac Interceptor	$ 6,769,000	$ 0	$ 6,769,000
A-11, -12	Upper Potomac Interceptor	3,911,000	0	0
B-1 to B-7	West Rock Creek Diversion	3,313,000	0	0
C-20 to C-29, part of C-25	Rock Creek Main Interceptor	9,362,000	0	0
C-11 & C-18	Luzon Valley & Klingle Rd.	400,000[2]	400,000[2]	400,000[2]
D-4 to D-17, part of C-25	East Rock Creek Diversion	67,750,000	0	0
E-1	B St.-N.J. Ave. Trunk (part)	631,000	631,000	631,000
E-2	Easby Point Trunk	11,110,000	0	0
E-3, part	B St.-N.J. Ave. Trunk	7,078,000	0	0
F-1	Tiber Creek Trunk	19,022,000	0	0
G-2 to G-8	East Side Interceptor	81,015,000	0	0
I-1, part	Anacostia Main Interceptor	3,484,000	3,484,000	3,484,000
Total		$213,845,000	$4,515,000	$11,284,000

1. From Table 2-2, Appendix 2. Based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering. Does not include work in Area Z shown on Figs. 14, 15, and 16. Does not include any allowance for relieving existing combined sewers.
2. For completing the conversion work previously started in these sewer districts.

Table 25. Summary of Total Construction Costs, Projects A, B, and C

Item	Estimated construction cost,[1] Project: A	B	C
(1)	(2)	(3)	(4)
Reliefs for intercepting sewer system (Table 23)	$ 24,244,000	$88,942,000	$60,460,000
Converting combined systems to separate systems (Table 24)	213,845,000	4,515,000	11,284,000
Total	$238,089,000	$93,457,000	$71,744,000

1. Based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering. See footnotes of Tables 23 and 24 for additional notes.

Table 26. Estimated Annual Costs,[2] Projects A, B, and C

Item	Project A	B	C
Operating costs of pumping stations			
Labor	$ 350,000	$ 675,000	$ 450,000
Power	27,000	57,000	56,000
Maintenance, repairs, and supplies	36,400	128,100	71,100
Total operating costs	$ 413,400	$ 860,100	$ 577,100
Debt service costs of whole project, at 4.0 percent per year			
Project — Estimated construction cost			
A — $238,089,000	$9,523,600		
B — 93,457,000		$3,738,300	
C — 71,744,000			$2,869,800
Total annual cost	$9,937,000	$4,598,400	$3,446,900
Say	$9,940,000	$4,600,000	$3,450,000

2. Exclusive of the cost of maintenance and repair of the proposed sewers.

8. Conclusions

General. As described in Chapters F and G, and also in this Chapter H, the degree of pollution abatement obtained by eliminating or reducing overflows from combined sewers to receiving waterways can be varied over a wide range. At the top, as measured by the construction cost and the degree of pollution abatement, stands a project for the complete separation of all of the combined sewers of the District.

At the bottom, also as measured by the construction cost and the degree of pollution abatement, stands a project in which the interceptors would carry a minimum of five dilutions of the sewage and in which the overflows to the waterways would be frequent, but much less frequent than at present. Many such projects in other cities of the United States have dilution factors of 2.5 to 3.0 (Chapter F, particularly Table 12). The intercepting-sewer system in the District has dilution factors from 1.0 to 95.0 or more (Table 14, Chapter F). At many points in the existing system, the frequency and duration of overflows are excessive, as shown in Chapter F.

The uses and characteristics of the receiving waterway constitute an important yardstick in appraising the proper degree of pollution abatement to be selected. Thus, it appears to the Board that Rock Creek and the upper Potomac River upstream of the business and industrial parts of Georgetown should have much larger dilution factors (that is, fewer overflows) than the lower Potomac River and the Anacostia River.

The Board does not consider that dilution factors less than 5.0 (that is, one part of sewage to four parts of stormwater) would be acceptable for any of the waterways in the District.

Project A includes the complete separation of all sewers of the District. Projects B and C illustrate the effect of dilution factors in the lower range of what the Board considers to be acceptable overflow conditions in the District.

The estimated construction cost of each of the three projects studied is as follows (Table 25):

Project	Estimated cost
A	$238,089,000
B	93,457,000
C	71,744,000

Between the limits indicated, other degrees of pollution abatement, with corresponding dilution factors and corresponding costs, could be selected. In the opinion of the Board, Project B or C would result in an adequate degree of pollution abatement at a reasonable cost. It is not considered that the high cost of Project A would result in sufficient decrease in pollution, as compared with Projects B and C, to be justified from an engineering viewpoint. However, if public opinion and official judgment make the money available, Project A, giving the highest removal of pollution, could be adopted. Some features of Project A, comprising the separation of combined sewers where the effect would be the most beneficial, have been included to different extents in Projects B and C.

Regarding Project A, some important objections need to be considered, among which are the following:

1. The very high first cost, as well as higher annual costs.
2. A long period, 20 years or more, before completion.
3. The hazard, and even likelihood, of increased cost, resulting from the long construction period.
4. The postponement of accomplishing pollution abatement, except progressively, resulting from such a long period of construction.
5. The substantial loss of business to merchants, the great inconvenience and considerable hardship to citizens, building-owners and -users, pedestrians, traffic, and the general public, resulting from having twenty or more active sewer-trenching projects under construction simultaneously, and spread largely over the central portion of the District, for the entire period.
6. It is to be remembered that engineers and engineering boards employed by the District since the report of Hering-Gray-Stearns in 1890 have refrained from recommending the complete conversion of combined sewers of the District by means of separate sanitary sewers. Mr. J. Blake Gordon, Sanitary Engineer of the District, stated in 1929 that the project is such "as to stagger the imagination."

Comparison of Projects. The proposed dilution factors for the three projects, A, B, and C, are summarized in Table 21 (Section 2 of this chapter), and the required capacities and estimates of cost are summarized in Section 7 of this chapter (Tables 22 to 26, inclusive).

Project A includes the conversion of all combined sewers to separate systems.

Project B includes the conversion of only two small combined systems. The following dilution factors would be provided for the remaining areas:

Rock Creek	200
Potomac River	
Upper	30
From vicinity of mouth of Rock Creek to Hains Point	10
Below Hains Point	5
Anacostia River	10

To decrease the pollution of Rock Creek to a very great extent and to illustrate the close relation of cost and result, the Board has considered in Projects B and C an overflow conduit to be built along and beneath Rock Creek, of sufficient capacity to limit overflows to once in every two years, or, as an alternate, once in every five years, on the average. Such a conduit could be built later, should postponement be necessary.

The dilution factors listed in Table 21 are not all the same as those shown on Figs. 15 and 16. This is because the latter show mixtures of flows from separate and combined systems, and some of the resulting computed dilution factors are, therefore, less than those applying to the combined sewers only. The reason for this condition is that the average dry-weather flow is increased by the separate systems without a corresponding increase in diluting stormwater. An example of this is given in Section 2 of this chapter, under the sideheading, "Matters Relating to All Projects."

As compared with Project B, Project C provides more abatement of pollution for the upper Potomac River and somewhat less abatement for the lower Potomac River and the

Anacostia River. This is accomplished by the conversion to separate systems of the combined-sewer areas upstream of Georgetown, in addition to the two areas to be converted in Project B, and by the use of a lower dilution factor for the interceptors along Potomac River downstream of the mouth of Rock Creek to Hains Point and for the interceptors along Anacostia River. The pollution abatement for Rock Creek would be the same in Project C as in Project B.

Project C is based on the following dilution factors:

Rock Creek	200
Potomac River	
Upper	30
From vicinity of mouth of Rock Creek to Hains Point	5
Below Hains Point	5
Anacostia River	5

The degree of pollution abatement of the Potomac River from the vicinity of Rock Creek to the sewage treatment plant can be increased, if ever desired in the future, by the construction of another conduit more or less paralleling the proposed Potomac River Force Main and the Outfall Sewer Relief. To facilitate this, it is suggested that where the construction of the future conduits could best be built with the first works they should be included. Such locations are the crossings under the tidal-basin inlet channel and the Anacostia River.

Recommendations. The Board favors Project C as being realistic in its balance between the degree of pollution abatement and the first cost, and as giving relatively prompt relief from pollution, with far less inconvenience to the people of the District. The Board cannot bring itself to conclude that the disadvantages of Project A need to be suffered, and, on the other hand, the Board concludes that fully adequate relief from pollution will be provided by Project C.

Project C, therefore, is recommended.

The Board recommends that work be started forthwith on Project C, as outlined herein. This project in itself includes quite a large amount of conversion from combined systems to separate systems and would therefore serve as a guide if the conversion work should be expanded later to include additional areas.

Project C would clean the upper Potomac River above Georgetown so that it could be used for swimming, if adequate abatement of pollution is provided outside the District, and also for other recreation upstream of Key Bridge. After the completion of the conversion work now included in Project C, the degree of pollution abatement could be extended by converting Sewer Districts A-11 and A-12, which are located downstream of Key Bridge, thus cleaning the river still farther downstream. These sewer districts have been omitted from the work immediately included in Project C for two reasons. First, the river bank in the area affected is largely industrial and not suitable for recreational uses. Second, the nature of the land development in Sewer Districts A-11 and A-12 (Georgetown and vicinity) is such that the conversion work would be difficult and expensive. The streets are narrow and most of the buildings are located at or near the property lines. There are many row

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houses. Also, many of the existing sewer connections follow private property for considerable distances, rather than going directly to the public sewer. All of these features would result in expensive work in making the conversion.

In connection with the above discussion of converting Sewer Districts A-11 and A-12 to separate systems in the future, the District has adopted a policy of converting the adjoining combined District B-2 (Montrose District) gradually by requiring all future new buildings and house connections therein to be built for a separate system. The conversion by this procedure is expected to take 50 years or longer. If and when any construction or reconstruction of the main sewer in this district is undertaken, it would be well to consider providing minor local relief therein for certain of the combined sewers at the upstream end of the adjacent Normanstone District, to relieve a local troublesome flooding condition reported in the vicinity of 36th and Davis Streets, N.W. The local combined system in the small affected area of the Normanstone District could be separated, and the resulting separate sewers and storm sewers located upstream of the intersection of Davis Street and Observatory Circle could be diverted to the upstream end of the Montrose District.

A recommended program of doing all of the work needed in Project C is given in Chapter J, and a detailed plan showing the needed relief works for Project C is given on Plate 1 in the envelope at the back of the report. In connection with the proposed relief works shown on Plate 1, attention is directed to the fact that the locations are preliminary and approximate. Exact locations can best be determined when contract drawings for the work are about to be prepared.

CHAPTER I

RELIEF PROJECTS FOR COMBINED AND SEPARATE SEWERS

1. General Statement

As described in Chapter A, under the heading, "2. Existing Sewer System," the District sewer system consists of combined systems in certain areas, and separate systems in other areas, together with a system of intercepting sewers which convey the sewage to the Outfall Sewers and then to the existing sewage treatment plant at Blue Plains.

As explained in Chapter B, most, if not all, of the sewage of the W.S.S.D. (Fig. 4, Chapter B) is discharged to the sewer system of the District and thence to the sewage treatment plant of the District at Blue Plains.

The major existing sewers of the District, together with certain other sewers, exclusive of storm drains, are shown on Fig. 1 (Chapter A) and also on Plates 1, 2, and 3, which are in the envelope at the back of this report; and the sewer districts, or tributary areas, served by the various existing sewers are shown on Fig. 2 (Chapter A). Also shown on Fig. 2 is the dividing line between the combined and separate systems. A brief description of each of the major sewers is given in Chapter 5 of the investigative report of June 1955.

Capacities of Existing Sewers. Using basic design data given in Chapter E, an analysis has been made of the required and available capacities of the major existing sewers (Chapter 16 of the investigative report of June 1955). The required capacities are based on conditions of development estimated for the year 2000. The Board has reviewed the analyses previously made, and, in addition, has considered the records of sewer surchargings, street and sewer floodings, overflows, gagings, and the like, which are described briefly in Chapter D. In the case of certain existing sewers of the District which serve areas in Maryland (W.S.S.D.), the Board has made new computations of required capacities, so as to provide for the increased future populations in Maryland, as adopted by the Board.

In connection with the record of sewer surchargings, attention is directed to surcharge conditions in many of the main, submain, branch, and lateral sewers in the District, as affected by the design practice formerly followed. Many of these sewers were designed and built with their crown elevations below the crown elevations of the trunk sewers into which they discharge. This results in surcharge of these tributary sewers when the flow in the trunk sewers rises above the crowns of the branches, even though the branches themselves may have adequate capacity when computed on the basis of invert slopes. The results of this condition have been observed in many cases when studying the sewer surcharge records.

In designing proposed relief sewers, this condition should be kept in mind, and it should be corrected, insofar as possible, by designing the relief sewers low enough either to pick up the low branches properly or to lower the hydraulic grade line in the existing trunk sewers as much as practicable. If this is done, it will be found in many cases that the branches will be entirely adequate and satisfactory after the trunk sewer is properly relieved.

In connection with the record of street and sewer floodings, attention is directed to the likelihood that floodings may be more numerous at some locations than indicated,

particularly where two or more occurrences have been reported. The reason for this is that after a property-owner reports a flooding two or three times with no results and with nothing done to correct it, he may be inclined to cease reporting it, on the theory that the officials already know about the flooding and that there is no use in continuing to report it since previous reports resulted in no relief.

Relief Sewers Designed. Where it appears that relief sewers will be needed in the foreseeable future, the Board has made preliminary designs and cost estimates for such relief sewers. These designs are preliminary in nature and it is likely that revisions in details and possibly in locations of the sewers will be found desirable in some instances when contract drawings are being prepared, as a more detailed study of routes, existing structures, and the like, can be made at that time.

The results of the Board's studies of the combined and separate sewers are summarized in this chapter. A map showing major combined and other sewers, and certain proposed relief sewers, in a portion of the area of the District is given on Plate 2, in the envelope at the back of this report. Also shown on Plate 2 are the drainage-area limits for various sewer districts, and the record of floodings described in Chapter D. Proposed relief sewers for combined and separate sewers located outside of the area on Plate 2 are shown on Plate 3.

In general, reliefs for the existing combined sewers of the Maine Avenue Interceptor and certain adjacent areas (Sewer Districts E-4, -5, -7, -8, and part of E-3, as indicated by Area Z on Figs. 14, 15, and 16, Chapter H) have not been included in the Board's construction program, because the conversion of these sewers to separate systems has been authorized by the District Government. However, relief for certain of the local combined sewers in this area would be provided by reliefs proposed herein for the B Street-New Jersey Avenue Trunk Sewer District. After the existing combined sewers are converted to separate systems, these local sewers could be used for storm sewers.

Cost Estimates. Cost estimates have been made for the proposed relief sewers, based generally on the cost data given in Appendix 1. These estimates include an allowance for contingencies and engineering, and are based on the approximate present price level (Engineering News-Record Construction Cost Index of 700). The cost will, of course, be greater than shown, if the price level rises before construction is undertaken.

2. Combined Trunk Sewers

B Street-New Jersey Avenue Trunk Sewer. See pages 25 and 94 of the investigative report of June 1955 for a brief description of this existing trunk sewer and for information regarding its computed relative capacities.

This sewer is deficient in capacity for about 98 percent of its length. The over-all capacity of the deficient portion is approximately 49 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages for the observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at 4 of the 9 operating cup gages in the tributary area of this sewer. The observations referred to were made on 11 occasions during the three-month period, each set of observations being made soon after a rainstorm. At one location, K Street near Canal Street, S.W., surcharge occurred five times during the three-month period, the amount of surcharge above the sewer crown varying from 1.5 to 2.5 ft. At each of the other three locations, surcharge occurred once or twice, the amount varying from 1.3 to 2.8 ft. above the sewer crown.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms, in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities occurring at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, small surcharges (0.3 to 0.6 ft.) were indicated at three locations. These surcharges probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they showed small surcharges (maximum of 0.6 ft.) at the same three locations. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 cannot be identified.

It might be noted at this point that a surcharge of less than 1.0 ft. is considered to be of minor importance, ordinarily, in any sewer. However, when such a surcharge results from a light rainstorm, it usually indicates that a severe rainstorm probably would cause a greater and more serious surcharge.

The record shows several complaints of street and sewer floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at some 16 locations, 9 of which were in the low area west of Canal Street and south of Virginia Avenue. The others were distributed over the remainder of the sewer district, with three floodings reported along Constitution Avenue (one at 10th Street and two at 14th Street). At only two of the 16 locations was flooding reported more than once during the 12-year period, and then only twice at each location.

The street railway company has reported some trouble in this district resulting from water in the live-rail space beneath the tracks.

The assumed hydraulic grade line in the B Street-New Jersey Avenue Trunk Sewer is very shallow from 17th Street and Constitution Avenue, N.W., to Canal and C Streets, S.W. Through most of this stretch, the sewer crown is extremely shallow, being from 2 to 5 ft. below the street surface, for the most part. Upstream of 17th Street and Constitution Avenue, and downstream of Canal and C Streets, the assumed hydraulic grade line and the sewer crown are at greater depths, but are not at such elevation that surcharge would be permissible. In the downstream portion, particularly, surcharge of the trunk sewer can not be permitted, as it would result in the surcharge of numerous main, submain, branch, and lateral sewers which serve territory where the ground surface is very low, almost as low at some places as the crown of the trunk sewer.

The study indicates that the B Street-New Jersey Avenue Trunk Sewer is inadequate and needs relief, but the need does not appear to be as urgent as that in certain other sewer districts. The downstream portion of the district, where the ground and street surfaces are low-lying, appears to have the greatest need for relief.

A small amount of relief would be afforded this trunk sewer by removing from it the discharge of the existing Rock Creek Main Interceptor, as discussed in Chapter H. This is not reflected in the stormwater computations, however, as they were based on the assumption that this would be done.

Proposed relief sewers for this sewer district are shown on Plate 2. The relief sewers would be overflow lines only, not coming into operation until the flow in the tributary combined sewers reaches an amount equal to at least five times the estimated yearly average dry-weather flow in the respective combined sewers as of the year 2000 (dilution factor of 5.0).

The proposed relief sewer would be composed of two main lines: one discharging to the Anacostia River in the vicinity of Q and Half Sts., S.E., and the other discharging to the Potomac River west of the Tidal Basin, by way of a proposed relief sewer which would serve also as a relief for the existing Easby Point Trunk Sewer.

As shown on Plate 2, there would be two pumping stations, one serving each of the main relief sewers.

The proposed downstream relief line would start at 2nd and Canal Streets, S.W., whence it would flow to the south, being located in 2nd Street, F Street, and 1st Street, S.W., thence east in P Street to Half Street, S.E., and south in Half Street to an outlet in the Anacostia River. The proposed pumping station would be located in the vicinity of 1st and M Streets, S.W. A portion of the line downstream from the pumping station would be a force main and the remainder would be a gravity sewer.

This line would pick up overflow from several existing combined sewers, and there would be two short branches in Canal Street, as shown on Plate 2. In this way, relief would be provided for certain existing branch sewers which are now inadequate.

The proposed upstream relief line would start at 12th Street and Constitution Avenue, N.W., and would flow to the west, being located just south of Constitution Avenue, with the downstream end at 17th Street and Constitution Avenue, N.W., where it would discharge to a proposed pumping station. This station would pump the flow to a proposed relief sewer which would serve as a relief for the Easby Point Trunk Sewer as well as for the B Street-New Jersey Avenue Trunk Sewer, and which would flow in a southwesterly direction to an outlet in the Potomac River.

The proposed relief sewers have been designed on the basis of a reversal of flow in the existing B Street-New Jersey Avenue Trunk Sewer between 9th and 17th Streets, N.W., during times of storm. At such times, the direction of flow would be to the west, rather than to the east as it now is at all times and as it would continue to be in the future except during rainstorms causing the flow to exceed a value equal to five times the estimated yearly average dry-weather flow as of the year 2000 (dilution factor of 5.0).

To accomplish the proposed reversal of flow, a permanent bulkhead would be built in the existing trunk sewer where it crosses 9th Street, N.W., with an opening at the bottom for dry-weather flow plus diluting stormwater (dilution factor of 5.0), so this flow normally can continue downstream in the existing trunk sewer in a southeasterly direction. It would be desirable, also, as part of the proposed work, to divert the existing Constitution Avenue Sewer at 9th Street, so that it would discharge to the existing trunk sewer downstream (easterly) of the proposed bulkhead.

After the completion of the proposed relief work, the existing trunk sewer from 12th Street and Constitution Avenue, N.W., to 2nd and Canal Streets, S.W., would be adequate without further relief.

A study was made on the basis of using one long relief line extending from 17th Street and Constitution Avenue, N.W., more or less parallel to the existing trunk sewer, to an outlet in the Anacostia River, as an alternate to the recommended plan based on two separate main relief lines with two different outlets. The recommended plan, with two separate main lines, has the lower construction cost.

Also, the use of two main lines has other advantages over the alternate plan, particularly in the matter of providing relief sooner where most urgently needed. The low area adjacent to the downstream line is now inadequately drained. The proposed downstream relief line can be built to serve this area, without the expenditure of money to build a larger

sewer to serve also the upstream area along Constitution Avenue, and therefore is likely to be built at an earlier date than if the larger sewer were necessary.

Also studied was an alternate location near the Anacostia River for the proposed pumping station now shown in 1st Street. It proved more economical to place the pumping station approximately at the location shown. The actual location is subject to more detailed study when contract drawings are about to be prepared.

The proposed downstream line of the B Street-New Jersey Avenue Trunk Sewer Relief, below Canal Street, would vary from 72 in. to 10 ft. 0 in. in diameter, or equivalent, and would be 8,980 ft. long. Its cost, exclusive of the pumping station but including branches, is estimated to be $3,100,000. The estimated cost of the pumping station is $4,150,000, giving a total cost of $7,250,000 for the downstream relief line.

The proposed upstream relief line, west of 12th Street, would vary from 72 in. to 12 ft. 0 in. in diameter, or equivalent, and would be 4,110 ft. long. Its cost, exclusive of the pumping station, is estimated to be $1,750,000. The estimated cost of the pumping station is $4,470,000, giving a total cost of $6,220,000 for the upstream relief line.

The total cost of the proposed works for the upstream and downstream sections of the B Street-New Jersey Avenue Trunk Sewer Relief is as follows: sewers, $4,850,000; pumping stations, $8,620,000; and total, $13,470,000.

Construction of the proposed relief sewers would provide better service to the entire tributary area, as the hydraulic grade line in the existing trunk sewer would be lowered several feet throughout most of its length. The crown of the existing trunk sewer is too shallow, as stated above, resulting in the surcharge of many branch, main, submain, and lateral sewers.

In connection with the existing B Street-New Jersey Avenue Trunk Sewer, there is an existing gate chamber at the intersection of 10th Street and Constitution Avenue, N.W., where an existing high-level drain is connected to the trunk sewer. Since it is possible under certain conditions for sewage to pass from the trunk sewer to the drain and thence to the Tidal Basin, the Board has been asked for recommendations regarding the gate chamber, which is in poor structural condition.

The chamber originally contained three backwater gates which were intended to prevent the overflow of sewage from the trunk sewer to the Tidal Basin, but to permit discharge of stormwater from the drain to the trunk sewer during times of high water in the Potomac River and therefore in the Tidal Basin. These backwater gates have deteriorated until they are useless.

The Board, by letter of March 31, 1955, made a preliminary recommendation that the tide gates and seats in the chamber be replaced and that the tide gate in the high-level drain near the outlet, or Tidal Basin, end of the drain be inspected, and then repaired or replaced as necessary. The preliminary recommendation suggested also that the concrete masonry in the chamber be repaired.

Since the preliminary recommendation was made, the openings in the chamber, between the trunk sewer and the drain, have been closed by wooden stop-planks, which, of course, prevent all passage of water between the sewer and drain, in either direction, thus eliminating need for the tide gates. The Board deems this satisfactory if the District does not wish to have an automatic outlet for stormwater in the drain to pass to the trunk sewer, which the tide gates would permit. However, these stop-planks should never be removed except possibly for temporary or emergency discharge of stormwater from the drain. If they are so removed, they should be replaced immediately, as soon as the desired purpose is accomplished.

It is very important that no opportunity be afforded for sewage to overflow from the existing B Street-New Jersey Avenue Trunk Sewer at this location to the Tidal Basin.

Easby Point Trunk Sewer. See pages 26 and 95 of the investigative report of June 1955 for a brief description of the principal existing sewers of this district and for information regarding their computed relative capacities.

The existing Easby Point Trunk Sewer is deficient in capacity for about 93 percent of its length. The over-all capacity of the deficient portion is approximately 47 percent of the required capacity. Similarly, the F Street-9th Street Branch Sewer, in the Easby Point area, is deficient through 69 percent of its length, with the capacity of the deficient portion being about 60 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at 10 of the 17 operating cup gages in this sewer district. The observations were made on 11 occasions during the three-month period, each set of observations being made soon after a rainstorm. At one location, 13th and F Streets, N.W., surcharge was found on five observations, the amount of surcharge above the sewer crown varying from 2.3 ft. to 3.8 ft. At the other locations surcharge occurred from one to four times during the three-month period. The maximum surcharge at these locations was 1.6 ft.

The observed surcharges occurred in the trunk sewer and in the F Street-9th Street Branch Sewer, with small surcharges at two points on other branch sewers.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms, in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities occurring at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, surcharges were indicated at seven locations, the maximum being 7.3 ft. above the sewer crown. These surcharges probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they showed surcharges at three locations, the maximum surcharge being 5.8 ft. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 can not be identified.

The record shows several complaints of street and sewer floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at some 19 locations, but only one occurrence was reported at each of 18 locations, during the 12-year period. Two occurrences were reported at one location. The worst condition, in respect to these floodings, appears to be in the vicinity of F Street from 11th Street to 13th Street, and in the vicinity of H and I Streets from 13th Street to 14th Street.

The street railway company has reported some trouble in this district resulting from water in the live-rail space beneath the tracks.

Most of the existing Easby Point Trunk Sewer is at a normal depth below the street or ground surface. Portions of the line, as, for example, in New York Avenue, are too shallow to provide proper service to abutting property. Also, portions of the F Street-9th Street Branch Sewer are too shallow. Therefore, it is not practicable to permit surcharge of any portion of the trunk sewer or the branch named.

The study indicates that the principal sewers of this district are inadequate and need relief. Most rainstorms, even the light ones, cause some surcharging. This, together with the results of the hydraulic computations, and other information mentioned above, indicates that heavier rainstorms would cause serious surcharging. In portions of the district the need is more urgent than in others, particularly in the vicinity of 13th and F Streets, and in the vicinity of 14th Street and New York Avenue.

The proposed relief sewer for this sewer district is shown on Plate 2. The portion of the relief sewer downstream of 15th and F Streets would be an overflow line only, not coming into operation until the flow in the tributary combined sewers reaches an amount equal to at least five times the estimated yearly average dry-weather flow in the respective combined sewers as of the year 2000 (dilution factor of 5.0). The portion of the relief sewer located in New York Avenue would be a combined sewer.

The proposed relief sewer would start at 9th Street and New York Avenue, N.W., where it would take a portion of the flow from the existing trunk sewer. It would run thence southwesterly in New York Avenue to 14th Street, where it would discharge to the existing 54-in. sewer in 14th Street on the southerly side of New York Avenue. This 54-in. sewer is adequate to serve as a portion of the relief sewer, from New York Avenue to F Street.

From the intersection of 10th and F Streets, a new relief sewer flowing to the west would be needed, continuing to the south in 15th Street, and thence in a southwesterly direction along an easement in public property to an outlet in the Potomac River, substantially as shown on Plate 2. As stated above, a portion of this relief sewer would be an overflow line only.

The proposed relief sewer would pick up flows and overflows from various combined sewers along its route. At a point near the intersection of Constitution Avenue and 17th Street, it would receive the discharge from a proposed pumping station serving a relief sewer for the existing B Street-New Jersey Avenue Trunk Sewer, as discussed above.

Some relief would be provided for the Easby Point Trunk Sewer and for its branches in 14th Street north of New York Avenue, by a planned extension of the proposed Slash Run Trunk Sewer Relief in L Street, from 16th Street to 14th Street, as discussed later in this chapter. This extension would divert to the proposed Slash Run Trunk Sewer Relief the entire flow in the existing sewers in 14th Street at L Street. This diversion would be desirable, as the branch sewers in 14th Street south of L Street are inadequate and need relief. Some of the surchargings and floodings discussed above occurred along this portion of 14th Street.

Furthermore, the proposed Slash Run Trunk Sewer Relief extension in L Street could be used to provide an outlet for gravity drainage from the Thomas Circle underpass, which is now served by a local stormwater pumping station discharging to the Easby Point system. A short lateral line from L Street to Thomas Circle would be necessary to provide the gravity drainage. This lateral line, however, is not included in the Board's program or estimates of cost.

The proposed relief sewer in F Street is shown to extend to 10th Street, but the computed deficiency in capacity for the existing F Street sewer east of 14th Street is not very great, and it is possible that no serious surcharging would occur east of 14th Street after the proposed relief sewer downstream thereof is completed. However, if objectionable surcharging should occur, the relief sewer could be extended in F Street from 14th Street to 10th Street.

The portion of the existing branch located in 9th Street has excess capacity, and the existing sewer in F Street from 10th Street to 9th Street will be adequate after the proposed relief sewer in F Street is built as far upstream as 9th Street, N.W.

Construction of the proposed relief sewer will lower the hydraulic grade line in certain places where the sewer crown is now too shallow, particularly in New York Avenue.

Consideration was given to using the existing 36-in. and 60-in. sewers located in 12th and 13th Streets, respectively, south of New York Avenue, to carry part of the relief load, but this did not appear desirable.

It is considered desirable to construct portions of the proposed relief sewer in 15th Street and F Street, and possibly in New York Avenue, in tunnel because of the traffic and other problems in this area. Possibly construction of portions of the proposed relief sewers can await the scheduled removal of the street-car tracks which are now in place in some of the affected streets.

As soon as the relief sewer is completed downstream of 14th and F Streets, a connection should be made between the existing 66-in. by 99-in. sewer in New York Avenue and the existing 54-in. sewer in 14th Street on the south side of New York Avenue, so as to obtain the fullest advantage of the relief sewer, without waiting for the construction of the relief sewer in New York Avenue.

The proposed Easby Point Trunk Sewer Relief downstream of 10th and F Streets, N.W., would vary from 48 in. to 13 ft. 6 in. in diameter, with a length of 9,140 ft. Its estimated cost is $4,340,000. The proposed relief sewer in New York Avenue would vary from 60 to 78 in. in diameter, with a length of 2,420 ft. Its estimated cost is $520,000.

The total cost of the entire Easby Point Trunk Sewer Relief is $4,860,000.

Northeast Boundary Trunk Sewer. See pages 27 and 98 of the investigative report of June 1955 for a brief description of the Northeast Boundary Trunk Sewer and for information regarding its computed relative capacities.

This sewer is deficient in capacity for about 86 percent of its length. The over-all capacity of the deficient portion is approximately 54 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at 36 of the 55 operating cup gages in this sewer district. The observations were made on 11 occasions during the three-month period, each set of observations being made soon after a rainstorm. At two locations, surcharge occurred on seven observations, the amount of surcharge above the sewer crown varying from 0.5 ft. to 2.7 ft. At other locations surcharge occurred from one to six times during the three-month period. The maximum surcharge was 10.2 ft. during this period.

The observed surcharges occurred in the trunk sewer and in several of the main, submain, and branch sewers, particularly in the O Street-V Street Branch Sewer, and in the Maryland Avenue Sewers and their branches in 7th, 8th, and 9th Streets, N.E.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms; in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities recorded at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, they showed surcharges at 23 locations, the maximum being 12.7 ft. above the sewer crown, which occurred at 14th and H Streets, N.E. These surcharges probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they

showed surcharges at 17 locations, the maximum surcharge being 8.7 ft., again at 14th and H Streets. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 can not be identified.

The record shows numerous complaints of street and sewer floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at over 100 locations, sometimes as many as three or four times, or more, at one location, during the 12-year period. The worst conditions, in respect to these floodings, appear to be in the vicinity of 19th Street north of C Street, N.E.; in the vicinity of H Street from 6th Street to 14th Street, N.E.; in the vicinity of 6th, 7th, 8th, and 9th Streets, south of Maryland Avenue, N.E.; and along Sherman Avenue north of Euclid Street, N.W.

The street railway company has reported considerable trouble in this district resulting from water in the live-rail space beneath the tracks, at various locations.

Except in certain comparatively short stretches, the existing Northeast Boundary Trunk Sewer is somewhat shallow. At some points, the sewer crown is only 3 or 4 ft. below the street or ground surface. Furthermore, along a considerable portion of the route of the trunk sewer, particularly the portion located in Florida Avenue, the street or ground surface is somewhat higher than the street or ground surface a short distance (say, one to three blocks or more) southwesterly of the sewer location. Thus, the trunk sewer does not provide a good outlet for branch sewers serving the lower area, since the trunk sewer is at a comparatively high elevation. Some or all of these branch sewers are constructed with their crowns considerably lower than the crown of the trunk sewer, resulting in surcharge of the branches whenever the trunk sewer is full or nearly full. As a result of these conditions, it is not desirable to consider any surcharging of the trunk sewer, when designing relief sewers.

The study indicates that the principal sewers of this district need relief. Most rainstorms, even the lighter ones, cause some surcharging. This, together with the results of the hydraulic computations, and other information mentioned above, indicates that heavier rainstorms would cause serious surcharging. In portions of the district the need is more urgent than in others, particularly in the vicinities given above in discussing the street and sewer flooding conditions.

Proposed relief sewers for this sewer district are shown on Plate 2. There would be two separate lines, one upstream and the other downstream.

The upstream relief sewer would be a combined sewer and would start at Sherman Avenue and Morton Street, N.W., where it would take a portion of the flow from the existing trunk sewer. It would run thence south in Sherman Avenue, Florida Avenue, and Ninth Street to the line of the proposed Inner Loop Freeway, just south of T Street, N.W. From this point, it would flow in a southeasterly direction, being located along the northerly side of the right of way for the proposed Freeway, to an outlet in the existing Northeast Boundary Trunk Sewer in Florida Avenue near 7th Street, N.E. Along the portion of the Freeway which will be depressed below the ground surface, the proposed relief sewer would be located outside the Freeway excavation, as the sewer would be too high to construct it beneath the depressed roadway.

The downstream relief sewer would be an overflow line, only, not coming into operation until the flow in the tributary combined sewers reaches an amount equal to at least five times the estimated yearly average dry-weather flow in the respective combined sewers, as of the year 2000 (dilution factor of 5.0). The downstream relief sewer would start at 17th and E Streets, N.E., and would flow thence east in E Street, south in 20th Street to D Street, and thence southeasterly in an easement in public property to an outlet in the Anacostia River.

As shown on Plate 2 and as discussed below, the Northeast Boundary Trunk Sewer and certain of its branches would be provided additional relief by the diversion of some of its tributary area to the proposed Tiber Creek Trunk Sewer Relief.

After the completion of the proposed reliefs, the existing trunk sewer from 7th Street and Florida Avenue, N.E., to 17th and E Streets, N.E., would be adequate without further relief.

The proposed relief sewers would accomplish desired lowering of the hydraulic grade line in the existing trunk and other sewers, at certain locations, thus resulting in considerably improved service for the entire sewer district.

It would not be possible to drain properly the depressed portion of the proposed Freeway to either the existing or proposed sewers in this sewer district, as they are too high. Therefore, the proposed relief sewer has been designed to take the entire stormwater flow from the depressed Freeway east of 14th Street by means of a pumping station expected to be located in the vicinity of 3rd and P Streets, N.W. It has been assumed that the pumping station would discharge to the existing O Street-V Street Branch Sewer, which in turn would discharge to the proposed relief sewer in the vicinity of 1st and O Streets, N.E. The pumping station and its discharge line would be part of the Freeway project.

Through a portion of the route where the proposed relief sewer is shown located along the line of the Freeway, it would supplant a future local sewer which otherwise would be needed along the Freeway in this vicinity for local drainage and to provide for existing sewers interfered with by the Freeway. This is an economic advantage for the proposed route. Another important advantage of construction along the line of the Freeway is that there would be much less interference with traffic and business than if the relief sewer were located in existing streets.

The downstream section of the proposed relief sewer would correct a very bad drainage situation along and in the vicinity of 19th Street, from C Street to Rosedale Street, N.E. There is a local 54-in. and 48-in. combined sewer in 19th Street at this location, which discharges to the Northeast Boundary Trunk Sewer at C Street, at a very low relative elevation. In fact, the crown of the local sewer is at a lower elevation than the crown of the trunk sewer, from the trunk to a point 2,400 ft. upstream. Also, the street surface of 19th Street is at a lower elevation than the crown of the trunk sewer for a distance of 900 ft., being 5.0 ft. lower at one place. Obviously, this street can not be drained properly, nor the sewer served properly, by the Northeast Boundary Trunk Sewer. As shown on Plate 2, numerous floodings have been reported in the vicinity.

To correct this situation, the proposed downstream relief sewer has been planned on the basis of a reversal of flow in the existing 54-in. sewer in 19th Street between C and E Streets, N.E., during times of storm. At such times, the direction of flow in this sewer would be to the north, rather than to the south as it now is at all times and as it would continue to be in the future except during rainstorms causing the flow in the local sewer to exceed a value equal to five times the estimated yearly average dry-weather flow in that sewer, as of the year 2000 (dilution factor of 5.0).

To accomplish the desired reversal of flow in the 54-in. sewer, a permanent bulkhead would be built in this sewer near its junction with the Northeast Boundary Trunk Sewer, having an opening at the bottom of the bulkhead for the dry-weather flow plus diluting stormwater (dilution factor of 5.0), so this flow normally can continue to the Northeast Boundary Trunk Sewer.

While the proposed Northeast Boundary Trunk Sewer Relief would correct defective drainage conditions at many locations, it is considered that its construction can be deferred

until after more urgently needed projects are completed. However, when the pertinent portion of the proposed Inner Loop Freeway is about to be constructed, it would be desirable, if not necessary, to build the proposed relief sewer where it parallels the Freeway, before the Freeway structures are built.

The upstream section of the proposed Northeast Boundary Trunk Sewer Relief would vary from 30 in. to 22 ft. 0 in. in diameter, or equivalent, and would be 15,950 ft. long. Its estimated cost is $10,390,000.

The downstream section would be 11 ft. 0 in. and 16 ft. 0 in. in diameter, or equivalent, and would be 6,180 ft. long. Its estimated cost is $5,390,000.

The total estimated cost of both sections of the Northeast Boundary Trunk Sewer Relief is $15,780,000.

Northwest Boundary Trunk Sewer. See pages 25 and 100 of the investigative report of June 1955 for a brief description of the principal existing sewers of the Northwest Boundary district and for information regarding their computed relative capacities.

The existing Northwest Boundary Trunk Sewer is deficient in capacity for about 92 percent of its length. The over-all capacity of the deficient portion is approximately 57 percent of the required capacity. Similarly, the Q Street-18th Street Branch Sewer, in the Northwest Boundary area, is computed to be deficient through 64 percent of its length, with the capacity of the deficient portion being about 53 percent of the required capacity; and the Q Street-17th Street Branch Sewer is computed to be deficient through 78 percent of its length, with the capacity of the deficient portion being about 47 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at 13 of the 20 operating cup gages in this sewer district. The observations were made on 12 occasions during the three-month period, each set of observations being made soon after a rainstorm. At one location, 17th Street and Florida Avenue, N.W., surcharge was found on seven observations, the amount of surcharge above the sewer crown varying from 0.3 ft. to 2.8 ft. At other locations surcharges occurred from one to six times during the three-month period. The maximum surcharge was 5.6 ft.

The observed surcharges occurred in the trunk sewer, in the Q Street-17th Street Branch Sewer, and in the branch located in Champlain Street, Kalorama Road, and 16th Street.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms; in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities recorded at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, they showed surcharges at five locations, the maximum being 6.0 ft. above the sewer crown. These surcharges probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they showed surcharges at six locations, the maximum surcharge being 9.0 ft. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 cannot be identified.

The record shows numerous complaints of floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at some 40 locations, sometimes as many as 7 or 8 times at one location, during the 12-year period. The worst condition, in respect to these floodings, appears to be in the area served by the two branch sewers in 17th and 18th Streets, south of Florida Avenue, N.W.

The street railway company has reported some trouble in this district resulting from water in the live-rail space beneath the tracks.

For the most part, the Northwest Boundary Trunk Sewer has normal depths of cover below the street or ground surface. At one place the cover is only about 4 ft. It does not appear that surcharge of this sewer can be permitted, when planning the relief sewer.

During the course of the investigative study (report of June 1955), a determination was made of the proportion of impervious area in three separate blocks of the territory tributary to the Northwest Boundary Trunk Sewer (Chapter 13 of the investigative report). These blocks are those numbered 8, 10, and 11, in Table 8 of the investigative report, where the boundaries and a brief description of each block are given. The percentages of impervious area in these blocks were found to be 67.1, 74.7, and 74.2, respectively.

On the basis of the study made, it appears that the principal sewers of this district need relief. Most rainstorms, even the lighter ones, cause some surcharging. This, together with the results of the hydraulic computations, and other information mentioned above, indicates that heavier rainstorms would cause serious surcharging. In portions of the district the need is more urgent than in others, particularly in the vicinity of 17th Street, also in the vicinity of New Hampshire Avenue from Q Street to T Street, and along T Street from 17th Street to 14th Street.

Proposed relief sewers for this sewer district are shown on Plate 2. The main relief sewer would start at 14th Street and Florida Avenue, N.W., where it would take a portion of the flow from the existing trunk sewer. It would run thence south in 14th Street to the line of the proposed Inner Loop Freeway, just north of T Street, N.W., and thence would follow the line of the Freeway westward and southward to P Street, N.W., where it would leave the Freeway and run west in P Street to an outlet in Rock Creek.

A branch relief sewer is shown in 16th Street, from Kalorama Road to the main relief sewer at the line of the Freeway. This branch would take a portion of the flow from the existing sewer at Kalorama Road and 16th Street, N.W., and a portion of the flow from the existing trunk sewer in Florida Avenue at 16th Street.

The main relief sewer along the line of the Freeway would be constructed beneath the depressed roadway of the Freeway, and would take the total discharge from all intersecting existing sewers which cross this line, as well as the local drainage along the Freeway itself.

The proposed main relief sewer would supplant a future local sewer which would otherwise be needed along the Freeway in this vicinity for local drainage and to provide for existing sewers interfered with by the Freeway. This is an economic advantage for the proposed route. Another important advantage of construction along the line of the Freeway is that there would be much less interference with traffic and business than if the relief sewer were located in existing streets.

The main relief sewer would provide needed relief for the existing branch sewers serving areas in the vicinity of 17th and 18th Streets, south of Florida Avenue, N.W., by taking the flow from the upstream portions of their tributary areas. In addition, needed local relief would be afforded the existing Q Street-18th Street Branch Sewer in Q Street by cross-connecting it to the existing Q Street-17th Street Sewer at points near 18th and Q Streets and near Connecticut Avenue and Q Street.

The proposed relief sewers would serve as combined sewers. The dry-weather flow plus diluting stormwater (Chapter H) would be diverted from the main relief sewer to the existing East Rock Creek Diversion Sewer at a point just east of the proposed outlet at Rock Creek.

The extension of the proposed main relief sewer to the south of P Street, N.W., along the line of the Freeway was considered, in connection with the relief of the Slash Run Sewer District and in connection with local drainage needed in the vicinity of Washington Circle. However, there is no need for relief of the existing Slash Run Trunk Sewer downstream of where it would cross the Freeway, and it was deemed to be more economical to handle the local drainage project in the vicinity of Washington Circle independently of the Northwest Boundary District relief sewers, probably by means of a local storm drain from Washington Circle to Potomac River.

The main relief sewer for the Northwest Boundary Trunk Sewer District would be 7,960 ft. in length and would vary from 42 in. to 10 ft. 0 in. in diameter, or equivalent. The 16th Street branch would be 2,420 ft. in length with diameters varying from 36 to 48 in. The estimated cost of the main sewer is $2,260,000 and of the branch $620,000, making the total cost $2,880,000.

In view of the need for relief and in view of the over-all economy and other advantages to be gained by construction along the Freeway, it is deemed desirable that the proposed main relief sewer be built as soon as the excavation for the Freeway is made. It is thought that the construction of the branch relief sewer in 16th Street can be deferred to some future date, when the need for it is greater than now appears to be the case. This branch has been planned at the present time largely so that the main relief sewer would be given sufficient capacity to provide for the branch.

Piney Branch Trunk Sewer and Spring Road Trunk Sewer. See pages 23 and 102 of the investigative report of June 1955 for a brief description of the principal existing sewers of the Piney Branch district and for information regarding their computed relative capacities.

Since a relief sewer now under construction will relieve the portion of the Piney Branch Trunk Sewer downstream of 5th and Ingraham Streets, N.W., and will relieve, also, the old Piney Branch Relief Sewer downstream of the same intersection, the discussion herein deals only with the portion of the Piney Branch Trunk Sewer which is upstream of 5th and Ingraham Streets, and with the Spring Road Trunk Sewer, which joins the Piney Branch Trunk Sewer a short distance west of 16th Street, N.W. The relief sewer now under construction downstream of 5th and Ingraham Streets is called "Piney Branch Trunk Sewer--East Branch," as shown on Fig. 1 (Chapter A).

The existing Piney Branch Trunk Sewer upstream of 5th and Ingraham Streets is deficient in capacity throughout its length. The over-all capacity is 56 percent of the required capacity. The existing Spring Road Trunk Sewer is deficient in capacity for 97 percent of its length, the overall capacity of the deficient portion being 56 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at only four of the 18 operating cup gages in the portion of this sewer district which is tributary upstream of the intersection of 5th and Ingraham Streets. The observations were made on 12 occasions during the three-month period, each set of observations being made soon after a rainstorm. The surcharges were found on only two occasions at one location, and on only one occasion at each of the other three locations. The surcharges ranged from 0.2 to 1.8 ft.

A similar study of the observations in the case of the Spring Road Trunk Sewer shows surcharges at two of the three cup gages, for the three-month period. Surcharge occurred three times at one gage (Spring Road just west of 14th Street) and two times at the other (Spring Road just east of 14th Street). The surcharges ranged from 0.8 to 5.3 ft.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms; in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities recorded at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, they showed no surcharges in the Piney Branch Trunk Sewer or the Spring Road Trunk Sewer. When the gages were next observed, on July 23, 1956, they showed surcharges at four locations on the Piney Branch Trunk Sewer, three of which ranged from 6.8 to 8.4 ft., and surcharge at only one location on the Spring Road Trunk Sewer, the amount being 1.7 ft. above the sewer crown. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 cannot be identified.

Since few small surcharges occurred in 1956 in the Piney Branch Trunk Sewer, the surcharge record for 1955 was examined. This shows only one or two occurrences of surcharge at each of 14 of the 18 gages, during the observation period from May to October, 1955, and three to five occurrences each at three gages. One gage showed no occurrences. The height of the surcharges ranged from 0.7 to 3.5 ft. for the gages south of Quackenbos Street, and from 0.5 to 10.2 ft. north of this street. Several of the surcharge heights north of Quackenbos Street exceeded 8.0 ft. The rainstorms causing these high surcharges were fairly intense, the most intense one having rates of rainfall equal to about a 2-year frequency, as recorded at the Weather Bureau City Office gage.

The record shows a few complaints of floodings in the Spring Road Trunk Sewer area, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported in or near Spring Road, from 13th to 14th Street. The study did not extend to the area tributary to the Piney Branch Trunk Sewer north of Ingraham Street.

Numerous and serious floodings have occurred in the past at 5th and Ingraham Streets, N.W., where there is no outlet for the stormwater except in the sewers. The gutters slope down to this intersection from every direction, thus forming a "bowl." However, this has no bearing on the work discussed herein, as the relief sewer now under construction was designed to alleviate the troublesome condition in this vicinity.

For the most part, the existing Piney Branch Trunk Sewer upstream of 5th and Ingraham Streets is at a normal depth below the street surface, so little surcharging can be permitted when planning the proposed relief sewers. This applies to the Spring Road Trunk Sewer, also, although it is at greater than normal depths west of New Hampshire Avenue. However, branch and lateral sewers in this area are at such low elevations that surcharge of the trunk sewer can not be permitted.

During the course of the investigative study (report of June 1955), a determination was made of the proportion of impervious area in five separate blocks of the territory tributary to the Piney Branch Trunk Sewer (Chapter 13 of the investigative report). These blocks are those numbered 2, 5, 6, 7, and 9, in Table 8 of the investigative report, where the boundaries and a brief description of each block are given. The percentages of impervious area in these blocks were found to be 39.0, 45.9, 64.2, 64.5, and 72.7, respectively.

On the basis of the various studies made, it appears that the two trunk sewers under discussion need relief. Some surcharging results at certain locations from light storms. This, together with the results of the hydraulic computations, and other information

mentioned above, indicates that heavier rainstorms would cause serious surcharging. However, the need for relief does not appear very urgent, particularly in the case of the Piney Branch Trunk Sewer north of Ingraham Street. Relief here can be postponed for some time. In the case of the Spring Road Trunk Sewer, however, conditions downstream of 13th Street appear to be somewhat worse. Relief might well be provided here at an earlier date than for the Piney Branch Trunk Sewer.

Proposed relief sewers for the Piney Branch area are shown on Plate 3. The relief sewer for the Piney Branch Trunk Sewer would start at 4th and Cedar Streets, N.W., and would flow to the south, being located for the most part in the same street as the existing trunk sewer, terminating at or near 5th and Ingraham Streets, N.W., near the upstream end of the relief sewer now under construction. Only in one short stretch would the relief sewer depart from the route of the existing sewer: from Oglethorpe Street to Madison Street, the relief sewer would be located in, or adjacent to, 3rd Street rather than in 3rd Place.

A study was made of an alternate plan embracing tunnel construction for most of the proposed Piney Branch Trunk Sewer Relief, with the relief sewer located in higher streets east of the present trunk sewer, south of Whittier Street. In this stretch, the sewer would be located in Blair Road, 2nd Street, Oglethorpe Street, 3rd Street, Kansas Avenue, and Ingraham Street. This plan was not adopted, as it would cost considerably more than the recommended plan.

In the case of the Spring Road Trunk Sewer, a relief sewer has been planned in 13th Street, N.W., extending from Spring Road to Randolph Street, where it would discharge to the newly built Piney Branch Trunk Sewer--East Branch. In addition, there is now under construction at Spring Road and 13th Street, N.W., a needed connection between the Spring Road Trunk Sewer and the existing 4-ft. 6-in. by 5-ft. 6-in. sewer in 13th Street, which flows to the north to the Piney Branch Trunk Sewer--East Branch, at Randolph Street, so that the existing 13th Street sewer will take some flow from the Spring Road Trunk Sewer.

A short relief sewer would be needed to parallel the existing Spring Road Trunk Sewer from 16th Street to its junction with the existing Ogden Street 48-in. by 72-in. sewer west of 16th Street.

After the above reliefs for the Spring Road Trunk Sewer are completed, flow conditions in the existing sewer should be observed for several years. If it is then shown that additional relief is needed, the relief sewer in 13th Street at Spring Road could be extended east in Spring Road, to 11th Street, as computations indicate that this stretch may need relief. Deficiencies in capacity through the remainder of this trunk sewer probably are too small to require relief, but this cannot be judged until after the planned reliefs are completed and the resulting conditions observed.

The proposed relief sewers for the entire Piney Branch area would be combined sewers.

The relief sewer for the Piney Branch Trunk Sewer would vary in diameter from 18 in. to 9 ft. 6 in. Its length would be 8,650 ft. and its cost $1,820,000.

The relief sewer for the Spring Road Trunk Sewer would be 42 and 48 in. in diameter, with a total length of 1,130 ft. The estimated cost is $330,000.

The total cost of the proposed relief sewers in the Piney Branch area is $2,150,000.

Slash Run Trunk Sewer. See pages 26 and 106 of the investigative report of June 1955 for a brief description of the principal existing sewers of the Slash Run district and for information regarding their computed relative capacities.

There are three parallel trunk, main, and submain sewers in L Street from a point near 20th Street to 16th Street, which together serve a large portion of the Slash Run district. The center sewer, which is 66 in. in diameter for most of its length, is considered to be the trunk sewer within these limits, and the other two are designated as main and submain sewers.

The existing Slash Run Trunk Sewer is deficient in capacity for about 85 percent of its length. The overall capacity of the deficient portion is approximately 53 percent of the required capacity. Similarly, the L Street (North Side) Submain Sewer is deficient through 83 percent of its length, with the overall capacity of the deficient portion being about 27 percent of the required capacity. The L Street (South Side) Main Sewer is adequate in capacity to serve its tributary area, although at places its depth is inadequate. These sewers would serve more efficiently if there were adequate cross-connections between them, so the load would be divided suitably among the three sewers. There are two small (24-in.) cross-connections, but they are too small to be effective.

There is another fairly large branch sewer, located in M Street and other streets, which serves a large portion of the Slash Run district. This sewer is termed the M Street-17th Street Main Sewer. It is deficient in capacity through 90 percent of its length, the overall capacity of the deficient portion being 81 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at six of the 12 operating cup gages in the Slash Run district. The observations were made on 11 occasions during the three-month period, each set of observations being made soon after a rainstorm. At one location, 18th Street just north of M Street, N.W., surcharge was found on seven observations, the amount of surcharge above the sewer crown varying from 0.4 to 2.9 ft. At each of the other locations surcharge occurred from one to five times during the three-month period. The maximum surcharge was 5.1 ft.

The observed surcharges occurred in the trunk sewer and in all of the main and submain sewers previously mentioned. The most numerous surcharges occurred in the M Street-17th Street Main Sewer. The maximum heights of surcharge occurred in this main sewer and in the L Street (North Side) Submain Sewer.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms; in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities recorded at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, they showed surcharge at only one location, M Street, just east of 20th Street, N.W., the amount of surcharge being 3.6 ft. above the sewer crown. This surcharge probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they showed surcharges at two locations, the maximum surcharge being 4.1 ft., again at M Street near 20th Street. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 cannot be identified.

The record shows numerous complaints of floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at some 22 locations, sometimes as many as three times at one location, during the 12-year period. The worst condition, in respect to these floodings, appears to be in the vicinity of 16th and L Streets, N.W.

The upstream portion of the L Street (South Side) Main Sewer is entirely too shallow to serve abutting property, its minimum cover being only about 1.0 ft. Part of the trunk sewer, also, is very shallow. However, throughout most of the length of the trunk, main, and submain sewers of this district, they are at a normal but adequate depth to serve the abutting property. Only in the downstream reaches of the trunk sewer is the sewer deep enough to permit any surcharge in connection with the design of proposed relief sewers.

The existence of three fairly large parallel sewers in L Street is, in itself, indication of considerable trouble from flooding in this area. L Street is the lowest street in this sewer district, so stormwater accumulates there and causes trouble. The intersection of 17th and L Streets is particularly vulnerable, as the gutters slope down to this intersection from all four directions, forming a "sump."

The study indicates that certain of the principal sewers of this district need relief. Most rainstorms, even the lighter ones, cause some surcharging. This, together with the results of the hydraulic computations, and other information mentioned above, indicates that heavier rainstorms would cause serious surcharging. In portions of the district the need is more urgent than in others, particularly in the vicinity of 16th and L Streets, and also in the vicinity of 18th and M Streets. The study indicates that the three parallel sewers in L Street should be so cross-connected as to provide the maximum total capacity. However, even if this should be done, major relief still would be needed. Indications are that the relief should be provided at a fairly early date, at least for the sewers in L Street.

Proposed relief sewers for this sewer district are shown on Plate 2. These sewers would serve as combined sewers.

The main relief sewer would start in 16th Street a short distance north of M Street, N.W., where it would take the entire flow of the existing 54-in. trunk sewer. It would run thence south in 16th Street to L Street, west in L Street to 21st Street, and north in 21st Street about 200 ft., at which point it would turn to the northwest and cross the line of the proposed Inner Loop Freeway, to an outlet in the existing Slash Run Trunk Sewer at 22nd and M Streets. At this point, the dry-weather flow plus diluting stormwater would be diverted into the existing Slash Run Lateral Sewer flowing to the west in M Street, and the remainder of the flow would be discharged to the existing 10-ft. 0-in. by 11-ft. 0-in. Slash Run Trunk Sewer in 22nd Street on the north side of M Street. The portion of the trunk sewer downstream of this intersection has adequate capacity, with permissible surcharge, to convey the required flow to Rock Creek.

There would be a branch relief sewer in 18th Street from M Street to L Street, to relieve the downstream portion of the M Street-17th Street Main Sewer, and a branch or extension of the proposed main relief sewer in L Street, from 16th Street to 14th Street. The purpose of the latter branch is two-fold: It would provide needed and substantial relief for the Easby Point Trunk Sewer and for its branches in 14th Street, by cutting off the two Easby Point branches in 14th Street at L Street, and it could serve as an outlet for a gravity drain serving the Thomas Circle underpass, by the construction of a drain from the circle to L Street.

Likewise, the upstream end of the proposed relief sewer in 16th Street could be designed and built low enough to serve as a gravity outlet for draining the Scott Circle underpass.

Portions of both of the circles mentioned (Thomas and Scott) are depressed below the surrounding area and are served by local stormwater pumping stations discharging to the existing sewers in the vicinity. It would be desirable to provide the circles with gravity stormwater outlets, so as to lessen the danger of a long traffic blockage due to pump or power failure. However, the construction of the needed local sewers for gravity drainage of the two circles is not included in the Board's recommended program.

The street location of the proposed relief sewer in L Street from near 20th Street to 16th Street poses a problem. As stated, there are now three fair-sized sewers in the street. These three sewers are reported to be in good condition, for the most part, so it is not desirable to remove any of them to make room for the relief sewer. Such removal would necessitate a larger relief sewer than otherwise, because the capacity of the removed sewer would have to be replaced by the relief sewer, in addition to providing the needed relief capacity. It is suggested that room be made for the relief sewer by relocating an underground power line which lies between the trunk sewer near the center of the street and a 36-in. water main. This could be done west of Connecticut Avenue, at least, where it is understood the street is to be widened and repaved in the near future. The existing 72-in. sewer west of Connecticut Avenue is at a sufficiently low elevation that it has considerable value.

East of Connecticut Avenue, where there now is a new and wider pavement, consideration might be given to removing the existing 72-in. sewer, located in the sidewalk area, which, in this vicinity, is at too high an elevation to be fully effective, and replacing it with the proposed relief sewer, enlarged sufficiently to supplant the existing sewer. Conditions prevailing at the time when contract drawings are about to be prepared would determine the best procedure. In fact, alternate bids could be taken based on the two locations, to determine which would be the more economical.

The Board has considered the alternate plan of removing the existing 72-in. L Street (South Side) Main Sewer and replacing it with the proposed relief sewer throughout, somewhat as mentioned above. The estimated cost is about the same as for the recommended plan. However, this alternate plan has not been accepted, because it appears undesirable to abandon and remove the existing 72-in. sewer west of Connecticut Avenue, since it reportedly is in good condition, with minor exceptions.

Also, the Board has studied a third plan wherein the proposed main relief sewer would be located in M Street from 22nd Street to 16th Street and on to 14th Street, and would be built in tunnel, throughout. The estimated cost of this plan is about the same as that of the recommended plan. However, the available depth of cover for the tunnel, about 20 ft., would be somewhat less than desirable, and the increased hazards of shallow tunnel work in such an important street might run the cost up still higher. M Street carries very heavy traffic and it would be hazardous to the traffic to build a shallow tunnel in the street. This alternate plan would appear more favorable if much of L Street (the portion west of Connecticut Avenue) were not about to be torn up and repaved. This reconstruction will disrupt traffic and business anyway, so there should not be too much objection to the open-trench sewer construction in this portion of the street.

The main line of the proposed Slash Run Trunk Sewer Relief would be from 48 in. to 9 ft. 0 in. in diameter, with a length of 4,630 ft. Its estimated cost is $1,760,000.

The branch relief sewers would be 36 and 54 in. in diameter, with a total length of 2,000 ft. Their estimated cost is $440,000.

The total estimated cost of the entire Slash Run Trunk Sewer Relief is $2,200,000.

Tiber Creek Trunk Sewer. See pages 25 and 108 of the investigative report of June 1955 for a brief description of the principal existing sewers of the Tiber Creek district and for information regarding their computed relative capacities.

The existing Tiber Creek Trunk Sewer is deficient in capacity for about 70 percent of its length. The over-all capacity of the deficient portion is approximately 50 percent of the required capacity. Similarly, the F Street-G Street Submain Sewer, in the Tiber Creek area, is deficient through 70 percent of its length, with the over-all capacity of the deficient

portion being about 62 percent of the required capacity; and the 1st Street Branch Sewer, south of Massachusetts Avenue, is deficient through 84 percent of its length, with the overall capacity of the deficient portion being 78 percent of the required capacity.

A study of the surcharge record at the locations of the maximum-flow, or cup, gages, for observations made during a three-month period in 1956, from July 30 to November 6, which are considered to be more pertinent as to present-day conditions than the previous observations, shows surcharges at seven of the ten operating cup gages in this sewer district. The observations were made on 11 occasions during the three-month period, each set of observations being made soon after a rainstorm. At each of two locations, surcharge was found on seven observations, the amount of surcharge above the sewer crown varying from 0.5 ft. to 13.0 ft. At each of five other locations the surcharges occurred from one to five times during the three-month period, the maximum surcharge being 5.3 ft.

The observed surcharges occurred in the trunk sewer and in the F Street-G Street Submain Sewer.

The rainstorms which occurred during the three-month observation period mentioned above were not intense storms; in fact some of them were very light. However, on June 22, 1956, prior to this three-month period, a storm occurred which had a frequency of about once in 5 years, for the intensities recorded at the Weather Bureau City Office gage. When the cup gages were read on June 26, 1956, for the first time since October 10, 1955, they showed surcharge at only one location, F Street west of 2nd Street, N.E., the surcharge being 9.5 ft. above the sewer crown. This surcharge probably resulted from the storm of June 22, 1956, but this is not certain, since the gages had not been read since October 10, 1955. Similarly, when the gages were next observed, on July 23, 1956, they showed surcharges at four locations, the maximum surcharge being 3.0 ft. Several moderate rainstorms occurred between the times of the two observations (June 26 and July 23), so the rainstorm responsible for the surcharges observed on July 23 cannot be identified.

The record shows numerous complaints of floodings in this sewer district, for the study made for the 1936-1947 period, described in Chapter D. Floodings were reported at some 50 locations, sometimes as many as 3 or more times at one location, during the 12-year period. The worst condition, in respect to these floodings, appears to be in the area served by the two submain and branch sewers named above.

The street railway company has reported considerable trouble in this district resulting from water in the live-rail space beneath the tracks.

Portions of the Tiber Creek Trunk Sewer are very shallow, having a cover of only about 4.0 ft. in some places. Many of its branches enter with the crown considerably lower than the crown of the trunk sewer. Therefore, it is not possible to permit any except minor surcharge of this sewer when designing proposed relief sewers.

On the basis of the study made, it appears that the principal sewers of this district need relief. Most rainstorms, even the light ones, cause surcharging. This, together with the results of the hydraulic computations, and other information mentioned above, indicates that heavier rainstorms would cause serious surcharging. In portions of the district the need is more urgent than in others, particularly in the vicinity of New Jersey and Louisiana Avenues, N.W., also in F and G Streets east of the Union Station, and in 1st Street south of Massachusetts Avenue.

Proposed relief sewers for this sewer district are shown on Plate 2. The main relief sewer would start at 10th and H Streets, N.E., and would run thence west in H Street, south in 5th Street (mostly in tunnel) to K Street, S.E., where it would pass diagonally across to 6th and L Streets, S.E., and thence continue south in 6th Street and an easement in the Naval Gun Factory to an outlet in the Anacostia River.

Several branch relief sewers have been planned, as shown on Plate 2. The most important of these is that in Massachusetts Avenue and E Street extended, N.E., which would provide needed relief for the Tiber Creek Trunk Sewer itself.

All of the proposed relief sewers for the Tiber Creek area, including the main sewer and the branches, would be overflow lines, only, not coming into operation until the flow in the tributary combined sewers reaches an amount equal to at least five times the estimated yearly average dry-weather flow in the respective combined sewers, as of the year 2000 (dilution factor of 5.0).

The proposed Tiber Creek Trunk Sewer Relief has been planned to provide greatly needed relief, also, for the existing Northeast Boundary Trunk Sewer, in two comparatively small areas. One of these areas is along Massachusetts Avenue and East Capitol Street, from 6th Street to 11th Street, N.E. and S.E. A proposed branch relief sewer has been planned in C Street, N.E., for this area, and extending to 9th Street, which would take the flow from the entire tributary area of the existing sewers in 7th, 8th, and 9th Streets. A branch of this line would be located in 7th Street, N.E., to East Capitol Street and thence to 8th Street. This should permit these sewers to function properly thereafter, as they would not then be surcharged by backwater from an inadequate sewer, as they now are at times. Numerous floodings have been reported in this vicinity.

The other area of relief for the Northeast Boundary Trunk Sewer is in H Street from 5th Street to Florida Avenue, N.E. The proposed relief sewer in H Street would correct a very bad drainage situation along this street. There is a local combined sewer in H Street at this location, 54 to 75 in. in diameter, which discharges to the Northeast Boundary Trunk Sewer at Florida Avenue, at a very low relative elevation. In fact, the crown of the local sewer is at a lower elevation than the crown of the trunk sewer, from the trunk to the end of the local sewer, about 3,300 ft. upstream (west). Also, the street surface of H Street is at a lower elevation than the crown of the trunk sewer for a distance of 1,900 ft., from 10th Street to near 5th Street. The street surface at one place is 5.0 ft. lower than the crown of the trunk sewer. Obviously, this street cannot be drained properly, nor the sewer served properly, by the Northeast Boundary Trunk Sewer. As shown on Plate 2, numerous floodings have been reported in the vicinity.

To correct this situation, the proposed relief sewer in H Street has been planned on the basis of a reversal of flow in the existing 69-in. and 75-in. sewer in H Street between 10th Street and Florida Avenue, during times of storm. At such times, the direction of flow in this sewer would be to the west, rather than to the east as it now is at all times and as it would continue to be in the future except during rainstorms causing the flow in the local sewer to exceed a value equal to five times the estimated yearly average dry-weather flow in that sewer, as of the year 2000 (dilution factor of 5.0).

To accomplish the desired reversal of flow in the 69-in. and 75-in. sewer, a permanent bulkhead would be built in the 75-in. sewer near its junction with the Northeast Boundary Trunk Sewer, having an opening at the bottom of the bulkhead for the dry-weather flow plus diluting stormwater (dilution factor of 5.0), so this flow normally can continue to the Northeast Boundary Trunk Sewer.

A small amount of relief would be provided for the 4th Street and 6th Street-7th Street Sewer districts by taking some flow from their sewers where they would cross the proposed main relief sewer, in the vicinity of 5th and K Streets, S.E.

Certain of the proposed relief sewers in the Tiber Creek area are needed urgently and should not be postponed longer than necessary. However, the cost of building the main relief sewer is so great that some delay will be necessary.

The main relief line for the Tiber Creek Trunk Sewer Relief would vary from 66 in. to 16 ft. 6 in. in diameter, or equivalent, and would be 12,270 ft. long. Its estimated cost is $11,420,000.

The branch relief sewers would vary from 27 in. to 13 ft. 0 in. in diameter, or equivalent, with a total length of 8,680 ft. Their estimated cost is $4,430,000.

The total estimated cost of all sewers of the Tiber Creek Trunk Sewer Relief is $15,850,000.

3. Separate Trunk Sewers

Anacostia Main Interceptor District. The Board's study does not include the Anacostia Main Interceptor district, which is served largely by a separate system (District I-1, Fig. 2, Chapter A). The Board has considered, however, the small combined system in this district, and recommends that it be converted to a separate system, as shown in Chapter H, particularly Table 24.

Studies of the principal sewers in the Anacostia Main Interceptor district have been made by Whitman, Requardt and Associates, Engineers. The results are shown in two reports to the District of Columbia, Department of Sanitary Engineering, as follows:

Subject of report	Date of report
Anacostia Main Interceptor	July 11, 1955
Watts Branch Drainage Area	November 30, 1955

The Board has studied the above reports and has abstracted certain pertinent information therefrom, for the purpose of incorporating the needed work in this sewer district in the Board's recommended construction program (Chapter J). Information not pertaining to the Board's proposed construction program has not been abstracted, such as, for instance, improvements relating to storm drains or channels.

Regarding the Anacostia Main Interceptor, the first report states (page 10):

> 8. No increase in capacity of the Anacostia Main Interceptor or the Poplar Point Pumping Station will become necessary for at least ten years and probably not for many year thereafter. Annual peak flows should be computed from the wet-well level charts and reviewed periodically to determine the proportions of the capacity of the interceptor being used during a possible 15-year storm.

That report has the following statement, also (page 44), referring to the Anacostia Main Interceptor:

> It is not believed that this interceptor will have to be enlarged until many years in the future, if at all. In the future, high-water elevations will determine if this sewer is approaching its capacity.

Regarding the Anacostia Main Interceptor and Upper Anacostia Main Interceptor and Pumping Station, the first report recommends certain improvements as follows (pages 8 and 9):

Item	Estimated cost[1]
Construction of 5,600 lin. ft. of 27-in. and 30-in. relief sewer for Upper Anacostia Main Interceptor (immediately)	$250,000
Rebuilding four sewage regulators[2]	80,000
Improvements to Upper Anacostia Pumping Station	10,000
Total	$340,000

1. Estimated by Board, to conform to Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering.
2. This was recommended as an alternate to converting the combined systems to separate systems.

Regarding the Watts Branch Trunk Sewer, the second report recommends the construction of certain separate relief sewers during the next few years, as follows:

Phase No.	Recommended date of construction	Proposed relief sewer		
		Size	Length, ft.	Estimated cost[3]
(1)	(2)	(3)	(4)	(5)
1	1956	21" to 42"	3,650	$178,000
2	1957-1958	10" to 54"	7,350	400,000
3	1960	12" to 27"	5,850	212,000
--	1960	---[4]	---[4]	---[4]
Total			16,850	$790,000[5]

3. Estimated by Board, based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering.
4. Branch sewers on Hunt Place and 55th Street; size, length, and cost not given in report.
5. This provides for sewage from Maryland (W.S.S.D.) as well as from the District.

Summarizing, the total work recommended by Whitman, Requardt and Associates for the Anacostia Main Interceptor district, insofar as the Board's construction program is concerned, is as follows:

Anacostia Main Interceptor and Upper Anacostia Main Interceptor	$340,000
Watts Branch Trunk Sewer	790,000
Total	$1,130,000

The locations of the sewers recommended are shown on Plate 3, in the envelope at the back of this report.

Broad Branch Road Trunk Sewer. See pages 29 and 111 of the investigative report of June 1955 for a brief description of the existing Broad Branch Road Trunk Sewer and for information regarding its computed relative capacities.

This sewer is deficient in capacity for 53 percent of its length, for conditions estimated as of the year 2000. The over-all capacity of the deficient portion is 59 percent of the required capacity.

Through a length of 5,300 ft. at the upstream end, extending as far downstream as 32nd Street, N.W., the existing trunk sewer is estimated to have adequate capacity for conditions as of the year 2000. Downstream of 32nd Street, the sewer is inadequate, as far as the point near Audubon Terrace, N.W., where it discharges to a reconstructed 33-in. section of the same trunk sewer. The reconstructed portion, which extends from Audubon Terrace to the outlet at the existing Rock Creek Main Interceptor, is adequate for the year 2000.

Several spot depth-of-flow measurements were made in December 1955 in the Broad Branch Road Trunk Sewer, at three locations extending from Audubon Terrace to Fessenden Street, extended. The measurements were made during the middle of the day on various dates when there was little or no runoff from rainstorms. The measurements show that the depth of flow in the sewer was from 25 to 41 percent of the depth full, on the observation dates.

It has been concluded that the portion of the Broad Branch Road Trunk Sewer from 32nd Street to Audubon Terrace will need relief before the year 2000. It is thought that the relief can be deferred for many years.

To assist in determining when the relief will be needed, it is recommended that continuous recording gages be installed and operated at two or three locations where flow conditions would give a good indication of the impending need for relief. Spot depth-of-flow observations could be made at intervals over a period of one or more years, during dry weather and also during rainstorms, along the entire length expected to need relief, to provide a guide as to the best locations for the recording gages. Installation of these gages, it is thought, can be deferred for a time.

As shown on Plate 3, a relief sewer has been planned for the portion of this trunk sewer which is expected to need future relief. The relief sewer would start at Broad Branch Road and 32nd Street, N.W., and would be located in Broad Branch Road, more or less parallel to the existing trunk sewer, with the downstream terminus of the relief sewer at the upstream end of the 33-in. reconstructed trunk sewer, near the intersection of Broad Branch Road and Audubon Terrace.

The Broad Branch Road Trunk Sewer Relief would be 7,410 ft. long and would vary in diameter from 15 to 27 in. Its estimated cost is $280,000.

Falls Branch Trunk Sewer and Submain Sewer. See pages 28 and 112 of the investigative report of June 1955 for a brief description of the existing Falls Branch Trunk Sewer and Submain Sewer and for information regarding their computed relative capacities.

The Falls Branch Trunk Sewer has been computed (Table 19, investigative report of June 1955) to be deficient in capacity through two comparatively short stretches, for conditions estimated as of the year 2000. In one stretch the deficiency (2.8 cfs.) is only six percent of the actual capacity (47.8 cfs.), so it is considered that this deficiency can be ignored, insofar as the need for relief is concerned. The other stretch, immediately downstream of the junction of the Falls Branch Trunk and Submain Sewers, where the deficiency

computed in 1955 is material, will be provided complete relief by diverting the existing Falls Branch Submain Sewer from its present junction with the Falls Branch Trunk Sewer to a new junction at the downstream end of the deficient stretch of the trunk sewer. This will be done at some future date by the use of a short length of 36-in. sewer built in 1955 partly for this purpose (Plate 3), as will be explained.

The Falls Branch Submain Sewer is deficient in capacity for 36 percent of its length, for conditions estimated as of the year 2000. The over-all capacity of the deficient portion is 73 percent of the required capacity.

Through a length of 6,250 ft. at the upstream end, extending as far downstream as 46th and Brandywine Streets, N.W., the Falls Branch Submain Sewer is estimated to have adequate capacity for conditions as of the year 2000. Downstream of a point near this intersection, the sewer is inadequate for a length of 3,585 ft., extending to a point a short distance downstream of Massachusetts Avenue. In a portion of this stretch the inadequacy is so small as to be negligible. From the above location (near Massachusetts Avenue) to a point near the District line, the sewer is adequate, through a length of 1,835 ft. From the latter point to the outlet at the Falls Branch Trunk Sewer, the submain sewer is inadequate through a length of 960 ft.

Several spot depth-of-flow measurements were made in December 1955 in these sewers, the measurements being made during the middle of the day on various dates when there was little or no runoff from rainstorms.

The measurements in the Falls Branch Trunk Sewer were made at a point located a short distance downstream of the District line. They show that the depth of flow in the trunk sewer was from 23 to 27 percent of the depth full.

Measurements in the Falls Branch Submain Sewer were made at a point a short distance downstream of the District line, where the depth of flow was found to be from 27 to 34 percent of the depth full. Also, measurements made in the submain sewer at 48th Street and Alton Place, N.W., show that the depth of flow at this location was from 17 to 23 percent of the depth full.

Except for the relief expected to be made by changing the junction point of the Falls Branch Trunk Sewer and Submain Sewer, as mentioned above and as discussed below, it is expected that the trunk sewer will need no relief before the year 2000.

It has been concluded that three stretches of the Falls Branch Submain Sewer will need relief before the year 2000. In general, these are the stretches mentioned above as being deficient in capacity.

Insofar as the dry-weather and permissible[1] wet-weather flow is concerned, indications are that the submain sewer would not need relief for many years. However, it is reported that wet-weather flows in this sewer are excessive, to such an extent that it has been necessary to construct two temporary overflow lines from the submain sewer in Brandywine Street to the adjacent 84-in. storm sewer, to keep the surcharge depths as low as practicable in the submain. These overflow lines are located at 46th and 47th Streets, where the submain sewer is 18 in. in diameter. The storm sewer discharges to a westward-flowing stream just west of Massachusetts Avenue at 49th Street. Since this is near the Dalecarlia Reservoir, the overflow of sewage or mixed sewage and stormwater to this storm sewer and thence to the stream is particularly objectionable, as it is possible for the stream to overtop the levee around the reservoir. The stream is occasionally polluted by the overflows.

1. Stormwater runoff from areaways and depressed driveways as permitted by District regulations.

It is apparent that the reported wet-weather flows in the submain sewer greatly exceed the allowances recommended herein for the design of separate sewers. The computed deficiencies for the year 2000 are small, and the spot measurements of depths of flow in the existing sewer indicate only nominal dry-weather flows. Since the excessive flow apparently occurs only during or immediately following rainstorms, it may be difficult, if not impossible, to locate leaks by inspection at other times.

It is necessary that remedial steps be taken as soon as possible, to eliminate the surcharging of the separate sewer and the overflows to the storm sewer and thence to the stream.

The excessive wet-weather flow might be caused by one or more of several factors:

1. Roofwater or other stormwater connections to the separate sewers. Such connections may originate either on private property or on public property, the latter including streets and alleys.

2. Excessive openings in the manhole covers.

3. Outside foundation drains, which collect stormwater and groundwater from outside the foundation walls of houses and other structures, and which may be connected to the separate sewers.

4. Defective pipe joints on the sewers or house connections, or defective masonry joints in the manhole walls.

5. Defective structural conditions, such as cracked sewer pipes or manhole walls.

Regarding defective pipe joints, it is reported that the existing submain sewer is constructed of vitrified-clay "cylinder" pipes having no hubs or bells. The sewer pipes are reportedly laid on a concrete cradle, with the upper portion of each butt joint covered with a comparatively thin ring of cement mortar. However, this does not explain the excessive wet-weather flow in this particular sewer, as all pipe sewers of separate systems in the District were constructed of such pipes with similar joints prior to September 1928. After that date, bell-and-spigot pipes were used.

To reduce or eliminate the excessive wet-weather flow, the following remedial procedure is suggested for immediate action, substantially in the order given:

1. Inspect the entire length of the submain sewer by mirrors, and otherwise, as practicable, to ascertain defective structural conditions and leaks, insofar as such conditions can be detected by inspection, and to locate any deposits or other obstructions in the sewer. Run cleaning equipment through the entire length to be certain that there are no deposits or obstructions which can not be seen.

2. Seal the temporary overflows to the storm sewer.

3. Make spot measurements of water depths during rainstorms, in manholes along the entire length of the submain sewer, to ascertain the apparent locations where the quantity of stormwater is causing surcharge and where the conditions seem to be the worst.

4. Seal all openings in manhole covers in these locations, including those on tributary branch and lateral sewers, except for one pick hole in each cover.

5. Make tests throughout such locations, by the use of dyes or otherwise, to ascertain if there are any illegal stormwater connections to the submain sewer. It will be necessary to test every building and catchbasin along the line of the submain,to accomplish this. While making these tests, the storm drain should be watched, also, for illegal house connections. All illegal connections to the sewer or the drain should be corrected.

6. Install continuous water-level recorders in the manholes of the submain sewer at the locations where apparent excessive storm flows are found, and analyze the results hydraulically, to ascertain where the excess stormwater flow is actually occurring and where the conditions are the worst. To do this, it may be necessary to install the recording instruments themselves in temporary shelters built back of the curbs, to prevent the instruments from being submerged by high water or to obtain sufficient space for the instruments.

7. If the water-level records and hydraulic computations still indicate excessive stormwater flow in certain locations, make tests on all buildings and catchbasins along the lines of all branch and lateral sewers tributary to the submain in such locations, to ascertain any illegal stormwater connections. All illegal connections should be corrected.

8. If excessive stormwater flows still persist in the submain sewer, the locations of the stretches of sewer which contain leaky joints or pipes can be pinpointed by isolating each stretch, from manhole to manhole, one stretch at a time, by means of temporary plugs or bulkheads placed at the manholes, and then filling the sewer and manholes with water to the highest permissible elevation without causing backing up of water in basements. Measurement of the rate of fall of the water in the manholes should indicate which stretches appear to be the worst with regard to leaky joints and pipes.

9. After the stretches which apparently need extensive repairs or reconstruction are located, a study should be made in the areas where a needed relief sewer is indicated, to determine whether it is more economical to abandon the existing sewer and enlarge the relief sewer accordingly or to repair or reconstruct and enlarge the existing sewer in the light of the possible need for relief.

10. The sewer in those stretches where reconstruction or repair is determined to be necessary should then be uncovered and either the joints made tight by means of a concrete or other encasement or the sewer reconstructed, depending on conditions found when the sewer is uncovered and depending on the relative economy of the alternate operations at that time.

11. It may develop that some of the branch or lateral sewers are contributing excessive wet-weather flows to the submain sewer. If so, these sewers will need to be tested and repaired, in the same manner as described above for the submain sewer.

12. In some cases, it may develop that the excessive stormwater is coming from house connections. These connections should either be repaired or abandoned and reconstructed. The latter may be the more economical, and may be necessary in cases where it appears that excessive stormwater is coming from the outside foundation drains.

As shown on Plate 3, a relief sewer has been planned for the portion of the Falls Branch Submain Sewer which is expected to need relief before the year 2000. The preliminary design of the relief sewer has been based on the assumption that the excessive stormwater

flow in the existing system would be eliminated or reduced to permissible amounts, without the relief, except in the case of one sewer which is recommended to be abandoned.

The sewer recommended for abandonment is located in private property between Yuma Street and Alton Place and in 48th Street from Alton Place to Albemarle Street. This sewer is at an unnecessarily great depth and may be responsible for considerable infiltration. It is undesirable to have such a sewer located in private property. Inasmuch as a relief sewer is to be built in this vicinity, it appears desirable to divert the sewer on the west side of 48th Street north of Albemarle Street into the proposed relief sewer and abandon the existing sewer, as stated.

The proposed relief sewer would start at the manhole in Brandywine Street a short distance west of 46th Street, N.W., and would be located in Brandywine Street from this point to 48th Street. The deficiency in capacity in this stretch is so small that the relief sewer could be postponed for many years if the excessive wet-weather flow in the existing sewer can be eliminated or reduced to a permissible quantity.

The deficiency in capacity for the portion of the existing submain sewer located on the east side of 48th Street is so very small (0.9 cfs.) that no relief has been planned except downstream of Albemarle Street. Starting at Albemarle Street, the proposed relief sewer would take the entire flow of the existing sewer on the west side of 48th Street, thus permitting the abandonment of the existing sewer from Albemarle Street to Yuma Street, as stated above. This relief sewer would continue downstream in 48th Street, Alton Place, 49th Street, Yuma Street, Yuma Street extended, and an easement, joining the existing submain sewer west of Massachusetts Avenue.

No relief sewer would be needed from this junction to a point a short distance downstream of the District line. From this latter point, a proposed relief sewer would parallel the existing submain sewer for a distance of about 600 ft., ending at a point about 400 ft. upstream of the present outlet in the Falls Branch Trunk Sewer. The existing 24-in. submain sewer would be abandoned downstream of the latter point, for a length of about 400 ft., except for local use, and the entire flow would be diverted to a recently built 36-in. sewer which discharges to the Falls Branch Trunk Sewer, as mentioned above. This would provide full relief for an inadequate portion of the Falls Branch Trunk Sewer and would make unnecessary any relief for the portion of the submain sewer to be abandoned as a submain.

Except possibly for the short diversion sewer mentioned in the preceding paragraph, none of the proposed relief sewer should be designed or built until the problem of the excessive wet-weather flow in the Falls Branch Submain Sewer is solved. It may be desirable to abandon portions of the existing submain sewer, because of leaky joints or pipes, in which case the relief sewer should be designed to supplant the existing sewer, thus requiring more capacity than for relief, only.

The proposed Falls Branch Submain Sewer Relief would have a total length of 3,660 ft., and would vary in diameter from 12 to 24 in. Its estimated cost is $210,000. An additional allowance of $500,000 is included in the Board's cost estimates for the repair and reconstruction of portions of the existing sewers, to reduce stormwater flows to a permissible amount. The total estimated cost of the work in the Falls Branch district is $710,000.

Luzon Valley Trunk Sewer. See pages 29 and 112 of the investigative report of June 1955 for a brief description of the existing Luzon Valley Trunk Sewer and for information regarding its computed relative capacities.

This sewer is deficient in capacity for 62 percent of its length, for conditions estimated as of the year 2000. The over-all capacity of the deficient portion is 62 percent of the required capacity.

Through a length of 2,770 ft. at the upstream end, including all of the existing trunk sewer upstream of Georgia Avenue, the Luzon Valley Trunk Sewer is estimated to have adequate capacity for conditions as of the year 2000. At and downstream of Georgia Avenue, the trunk sewer is inadequate except for four comparatively short stretches located in the Army Medical Center (Walter Reed Hospital) area, and in Luzon Avenue and 16th Street.

Several spot depth-of-flow measurements were made in December 1955 in the Luzon Valley Trunk Sewer, in the manhole near 17th Street extended. The measurements were made during the middle of the day on various dates when there was little or no runoff from rainstorms. The measurements show that the depth of flow in the sewer was from 51 to 59 percent of the depth full, on the observation dates.

It has been concluded that the major portion of the trunk sewer where the capacity has been computed to be deficient will need relief before the year 2000. The relief may be needed in the near future, especially through the portion west of 16th Street, in Rock Creek Park, where it is particularly important that overflows of sewage or mixed sewage and stormwater be avoided. At one or two places upstream of Georgia Avenue, where the computed deficiency is only a small percentage of the actual capacity, the relief might be deferred.

To assist in determining when the relief will be needed, it is recommended that continuous recording gages be installed and operated at two or three locations where flow conditions would give a good indication of the impending need for relief. Spot depth-of-flow observations could be made at intervals over a period of one or more years, during dry weather and also during rainstorms, along the entire length expected to need relief, to provide a guide as to the best locations for the recording gages. Installation of these gages, it is thought, should not be deferred very long.

As shown on Plate 3, a relief sewer has been planned for the portion of this sewer which is expected to need future relief. The relief sewer would start at Georgia Avenue and Dahlia Street, N.W., and would continue downstream, adjacent to, and more-or-less parallel to, the existing trunk sewer, with gaps in the relief sewer at the locations where no relief is needed.

As previously mentioned herein, the conversion of the sewers in the Luzon Valley District from a combined system to a separate system has been started but not completed. It is recommended that the conversion be completed as soon as possible.

The Luzon Valley Trunk Sewer Relief would be 6,310 ft. long and would vary in diameter from 12 to 24 in. Its estimated cost is $310,000.

Oxon Run Trunk Sewer. The existing Oxon Run Trunk Sewer, described briefly on page 28 of the investigative report of June 1955, serves considerable area and population in Maryland, as well as in the District, and is expected to serve a still larger area and population in Maryland by the year 2000.

The tributary population in the District, as estimated for the year 2000, is 64,660 and that for Maryland, as estimated by the Board, is 66,000. This gives a total tributary population of 130,660 for the year 2000.

Only a portion of the Maryland population would be tributary at the point where the Oxon Run Trunk Sewer crosses the District line, this being 42,000 persons. The remaining 24,000 persons would be tributary through various existing and future sewers discharging to the trunk sewer at various points in the District.

The total tributary area in the District as of the year 2000 is 2,233 acres. The total tributary district in Maryland (Fig. 9 of the investigative report of June 1955) is expected to embrace an area of some 22,000 acres. As indicated on that figure, some of the Maryland area assumed to be tributary is beyond the Oxon Run drainage basin, so pumping would be required for some of the flow. However, as previously explained, all of the Maryland area is not expected to be developed and sewered by the year 2000. For sewer-design purposes, the Maryland area is considered to be 5,080 acres, of which 3,230 acres would be tributary to the trunk sewer where it crosses the District line, and 1,850 acres would be tributary to the Maryland sewers which discharge to the trunk sewer at points inside the District. The 5,080-acre area is estimated to have a population of 66,000 in the year 2000, representing 13 persons per acre.

The total effective tributary area, for design purposes, therefore, is 7,313 acres, consisting of 2,233 acres in the District and 5,080 acres in Maryland.

This sewer is deficient in capacity for 97 percent of its length, for conditions estimated as of the year 2000. The over-all capacity of the deficient portion is 33 percent of the required capacity.

Several spot depth-of-flow measurements were made in December 1955 in the Oxon Run Trunk Sewer, at two locations. The measurements were made during the middle of the day on various dates when there was little or no runoff from rainstorms. Measurements made a short distance downstream of where the trunk sewer crosses the District line, near Mississippi and Southern Avenues, S.E., show that the depth of flow in the sewer was from 37 to 40 percent of the depth full on the observation dates. At the other location, in Wahler Place, S.E., the depth of flow was found to be from 46 to 50 percent of the depth full.

It has been concluded that the Oxon Run Trunk Sewer will need relief before the year 2000 throughout its length. The time of needing the relief will depend largely on the rate of development of the tributary Maryland areas.

To assist in determining when the relief will be needed, it is recommended that continuous recording gages be installed and operated at two or three locations where flow conditions would give a good indication of the impending need for relief. Spot depth-of-flow observations could be made at intervals over a period of one or more years, during dry weather and also during rainstorms, along the entire length expected to need relief, to provide a guide as to the best locations for the recording gages. Installation of these gages, it is thought, should not be deferred very long.

As shown on Plate 3, a relief sewer has been planned for the Oxon Run Trunk Sewer. The relief sewer would start where the existing trunk sewer crosses the District line and would be located near, and more-or-less parallel to, the existing trunk sewer throughout its length.

A portion of the existing trunk sewer was constructed in tunnel. In the vicinity of the tunnel portion, the location of the proposed relief sewer should be such as not to endanger the existing sewer. Depending on conditions at the time, it might be desirable to consider building the proposed relief sewer entirely in trench, locating it around the hill rather than tunnelling through it.

The Oxon Run Trunk Sewer Relief would be 19,720 ft. long and would vary in diameter from 30 to 48 in. Its estimated cost is $1,810,000.

4. Summary

Proposed Relief Projects for Combined Trunk Sewers. Table 27 shows the estimated construction costs of the proposed relief projects for existing combined trunk sewers, together with the range of sizes and the lengths of the proposed relief sewers. The data are broken down into subdivisions for convenience in preparing a construction program (Chapter J). The estimated total cost of the proposed relief projects for combined trunk sewers is $57,190,000.

Proposed Relief Projects for Separate Trunk Sewers. Table 28 shows estimated construction costs of the proposed relief projects for existing separate trunk sewers, together with the range of sizes and the lengths of the proposed relief sewers. Certain data are broken down into subdivisions for convenience in preparing a construction program (Chapter J). The estimated total cost of the proposed relief projects for separate trunk sewers is $4,240,000.

Summary of Construction Costs of Proposed Relief Projects for Combined and Separate Trunk Sewers. Based on Tables 27 and 28, the construction costs of the proposed relief projects for combined and separate trunk sewers are summarized in Table 32, Chapter J. The estimated total cost of all of these relief projects is $61,430,000.

Table 27. Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing	Proposed relief sewer or pumping station		Estimated
	Sewer		

Table 27. Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing trunk sewer	Proposed relief sewer or pumping station: Item and limits	Sewer: Range of sizes	Sewer: Length, ft.	Estimated cost[1]	
(1)	(2)	(3)	(4)	(5)	
B St.-New Jersey Ave. Trunk Sewer	a. Downstream line:				
	1. Sewer from Anacostia River to pumping station	72" to 10'-0"	4,840	$1,830,000[2]	
	2. Pumping station	--	--	4,150,000	
	3. Sewer from pumping station to end at 2nd and Canal Streets, S.W.	90" & 96"	4,140	1,270,000	
	Total, downstream line	--	8,980	$7,250,000	
	b. Upstream line:				
	1. Sewer	72" to 12'-0"	4,110	$1,750,000	
	2. Pumping station	--	--	4,470,000	
	Total, upstream line	--	4,110	$6,220,000	
	Total, B St.-New Jersey Ave. Trunk Sewer Relief	--	13,090	--	$13,470,000
Easby Point Trunk Sewer	a. From Potomac River to Constitution Ave., N.W.	13'-6"	4,150	$2,610,000	
	b. From Constitution Ave. to 14th and F Sts., N.W.	96" & 9'-6"	3,320	1,310,000	

Note: Footnotes are at end of table.

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Table 27 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing trunk sewer	Proposed relief sewer or pumping station: Item and limits	Sewer: Range of sizes	Sewer: Length, ft.	Estimated cost[1]	
(1)	(2)	(3)	(4)	(5)	
Easby Point Trunk Sewer -- (cont.)	c. In New York Ave.	60" to 78"	2,420	520,000	
	d. In F St., from 14th St. to 10th St., N.W.	48" to 72"	1,660	420,000	
	Total, Easby Point Trunk Sewer Relief	--	11,550	--	$4,860,000
Northeast Boundary Trunk Sewer	a. Downstream line	11' -0" to 16' -0"	6,180	$5,390,000	
	b. Upstream line:				
	1. From 7th St. and Florida Ave., N.E., to 9th and T Sts., N.W.	96" to 22' -0"	9,600	9,280,000	
	2. From 9th and T Sts., N.W., to Sherman Ave. and Morton St., N.W.	30" to 78"	6,350	1,110,000	
	Total, upstream line	--	15,950	$10,390,000	
	Total, Northeast Boundary Trunk Sewer Relief	--	22,130	--	$15,780,000

Note: Footnotes are at end of table.

Table 27 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Table 27 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing trunk sewer	Proposed relief sewer or pumping station				
	Item and limits	Sewer		Estimated cost[1]	
		Range of sizes	Length, ft.		
(1)	(2)	(3)	(4)	(5)	
Northwest Boundary Trunk Sewer	a. Main line, from Rock Creek to 14th St. and Florida Ave., N.W.	42" to 10' -0"	7,960	$2,260,000	
	b. 16th St. Branch:				
	1. From main sewer at Freeway to Florida Ave.	42" & 48"	1,120	300,000	
	2. From Florida Ave. to Kalorama Rd., N.W.	36" & 42"	1,300	320,000	
	Total, 16th St. Branch	--	2,420	$ 620,000	
	Total, Northwest Boundary Trunk Sewer Relief	--	10,380	--	$2,880,000
Piney Branch Trunk Sewer (and Spring Road Trunk Sewer)	a. Piney Branch Trunk Sewer Relief, upstream of 5th & Ingraham Sts., N.W.	18" to 9' -6"	8,650	$1,820,000	
	b. Spring Road Trunk Sewer Relief	42" & 48"	1,130	330,000	
	Total, Piney Branch Trunk Sewer (and Spring Road Trunk Sewer) Relief	--	9,780	--	$2,150,000

Note: Footnotes are at end of table.

Table 27 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing trunk sewer	Proposed relief sewer or pumping station				
	Item and limits	Sewer		Estimated cost[1]	
		Range of sizes	Length, ft.		
(1)	(2)	(3)	(4)	(5)	
Slash Run Trunk Sewer	a. Main line:				
	1. From 22nd and M Streets, N.W., to 21st and L Streets	84"	1,000	$ 360,000	
	2. From 21st and L Streets to Conn. Ave. and L St.	9'-0"	1,850	760,000	
	3. From Conn. Ave. and L St. to 16th St., just north of M St., N.W.	48" to 9'-0"	1,780	640,000	
	Total, main line	--	4,630	$1,760,000	
	b. 18th St. branch, from L St. to M St.	36"	700	100,000	
	c. L St. branch, from 16th St. to 14th St.	54"	1,300	340,000	
	Total, branches	--	2,000	$ 440,000	
	Total, Slash Run Trunk Sewer Relief	--	6,630	--	$2,200,000

Note: Footnotes are on following page.

Table 27 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Combined Trunk Sewers

Name of existing trunk sewer	Proposed relief sewer or pumping station: Item and limits	Sewer: Range of sizes	Sewer: Length, ft.	Estimated cost[1]	
(1)	(2)	(3)	(4)	(5)	
Tiber Creek Trunk Sewer	a. Main line	66" to 16'-6"	12,270	$11,420,000	
	b. Branches	27" to 13'-0"	8,680	4,430,000	
	Total, Tiber Creek Trunk Sewer Relief	--	20,950	--	$15,850,000
Total, all relief projects for combined trunk sewers		--	94,510	--	$57,190,000

1. Based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering.
2. Includes cost of the two branch relief sewers in Canal Street.

Table 28. Estimated Construction Costs of Proposed Relief Projects for Separate Trunk Sewers

Name of existing sewer or district	Proposed relief sewer or project				
	Item and limits	Sewer		Estimated cost[1]	
		Range of sizes	Length, ft.		
(1)	(2)	(3)	(4)	(5)	
Anacostia Main Interceptor District[2]	a. Upper Anacostia Main Interceptor Relief	27" & 30"	5,600	$ 250,000	
	b. Repairing regulators and Upper Anacostia Pumping Station	--	--	90,000	
	c. Watts Branch Trunk Sewer Relief	12" to 54"	16,850	790,000	
	Total, Anacostia Main Interceptor District Relief	--	22,450	--	$1,130,000
Broad Branch Road Trunk Sewer	a. Broad Branch Road Trunk Sewer Relief	15" to 27"	7,410	--	$ 280,000
Falls Branch Submain Sewer	a. Falls Branch Submain Sewer Relief				
	1. Downstream of District line	21" to 24"	720	$ 30,000	
	2. From point west of Massachusetts Ave. to 48th and Albemarle Sts.	12" to 18"	2,080	130,000	
	3. In Brandywine St., from 48th St. to 46th St.	15"	860	50,000	
	Total, Falls Branch Submain Sewer Relief	--	3,660	$ 210,000	
	b. Repair and reconstruction of existing sewer	--	--	500,000	
	Total, Falls Branch Submain Sewer Relief	--	3,660	--	$ 710,000

Note: Footnotes are at end of table.

Table 28 -- (cont.). Estimated Construction Costs of Proposed Relief Projects for Separate Trunk Sewers

Name of existing sewer or district	Proposed relief sewer or project				
	Item and limits	Sewer		Estimated cost[1]	
		Range of sizes	Length, ft.		
(1)	(2)	(3)	(4)	(5)	
Luzon Valley Trunk Sewer	a. Luzon Valley Trunk Sewer Relief:				
	1. Downstream of 16th St.	18" & 24"	2,470	$ 100,000	
	2. Upstream of 16th St.	12" & 18"	3,840	210,000	
	Total, Luzon Valley Trunk Sewer Relief	--	6,310	--	$ 310,000
Oxon Run Trunk Sewer	a. Oxon Run Trunk Sewer Relief	30" to 48"	19,720	--	$1,810,000
Total, all relief projects for separate trunk sewers		--	63,790	--	$4,240,000

1. Based on Engineering News-Record Construction Cost Index of 700. Includes an allowance for contingencies and engineering.
2. As recommended by Whitman, Requardt and Associates, in two reports to the District of Columbia, Department of Sanitary Engineering, dated July 11, 1955, and November 30, 1955.

CHAPTER M

CONCLUDING STATEMENTS

1. The Sewer System and the Program

General Condition of Sewer System. In general, the Board has found the District's sewer system in fairly good physical condition. The outstanding defect is the inadequate capacity of certain intercepting sewers, which results in dry-weather overflows of sewage to the Potomac and Anacostia Rivers during the summer months and likewise results in too frequent overflows of mixed sewage and stormwater to these streams during rainstorms.

This defect can be remedied easily, given sufficient funds and time for building relief interceptors, and the Board recommends herein a program which will accomplish the desired results at a reasonable cost and within a reasonable time.

Many of the combined and separate systems are inadequate, according to recommended design standards. However, this is a common fault of the sewerage systems of most of the cities of the United States. Like the District of Columbia, most cities have outgrown their sewerage systems, in some cases due to unforeseen phenomenal growth. Like the District, most cities could remedy the situation in due time if sufficient funds were available.

Principal Aims of Recommended Program. The execution of the recommended program should give the District a very clean Potomac River upstream of Georgetown and a very clean Rock Creek, provided undue pollution does not come from sources other than the District. The Potomac River downstream of Georgetown and the Anacostia River should become reasonably clean.

The bad flooding conditions previously occurring in certain of the combined-system areas, from rainstorms, should be reduced to normal and tolerable conditions.

Estimated Cost of Recommended Program. The Board regards the estimated cost of the recommended program, about $133,000,000, as being entirely reasonable for the District, when spread over a period of about 15 years. The average annual construction cost would be equivalent to only about $10.00 per capita per year. Even if the price level should rise during the construction period, and the Board regards this as likely, the resulting increased annual construction cost per capita would not be unreasonable.

2. Summary and Conclusions

The principal conclusions and recommendations of the Board are summarized in the Letter of Transmittal to the Commissioners of the District, which precedes the report.

3. Acknowledgments

In making the investigation and in preparing this report, we are indebted to many members of the Department of Sanitary Engineering of the District, and especially to the following:

David V. Auld, Director

Roy L. Orndorff, Deputy Director

Office of Planning, Design and Engineering

Emil A. Press, Deputy Superintendent

George J. Moorehead, Chief, Planning Branch

Sewer Operations Division

Young J. Wright, Superintendent

Allan B. Fay, Deputy Superintendent

G. E. Hess, Yards, Shops & Equipment Branch

E. S. Walker, Sewer Maintenance Branch

H. A. Schreiber, Sewage Treatment Branch

M. H. Kinsinger, Pumping Station Branch

Water Operations Division

P. Lanham, former Superintendent

Claude Sizemore, present Superintendent

Andrew J. Robertson, Chief, Property, Accounting and Transportation Branch

We appreciate helpful assistance received from other divisions of the Department of Sanitary Engineering and from other departments of the government of the District.

We are under obligation to our respective partners for material assistance, and to members of our home-office staffs (Metcalf & Eddy of Boston, Greleey and Hansen of Chicago, and Whitman, Requardt and Associates of Baltimore) who have aided in the investigation and in the preparation of the report.

The report to the District upon "Investigation of the Sewerage System," dated June 1955, prepared by Metcalf & Eddy, Engineers, has been very helpful to the Board. The Board has incorporated in its report certain of the drawings and data given in that investigative report.

From various organizations we have received helpful information, and we are indebted particularly to the following:

Washington Suburban Sanitary Commission

Interstate Commission on the Potomac River Basin

United States Engineer Office, Washington District

United States Weather Bureau, Department of Commerce

United States Coast and Geodetic Survey, Department of Commerce

United States Geological Survey

Washington Board of Trade

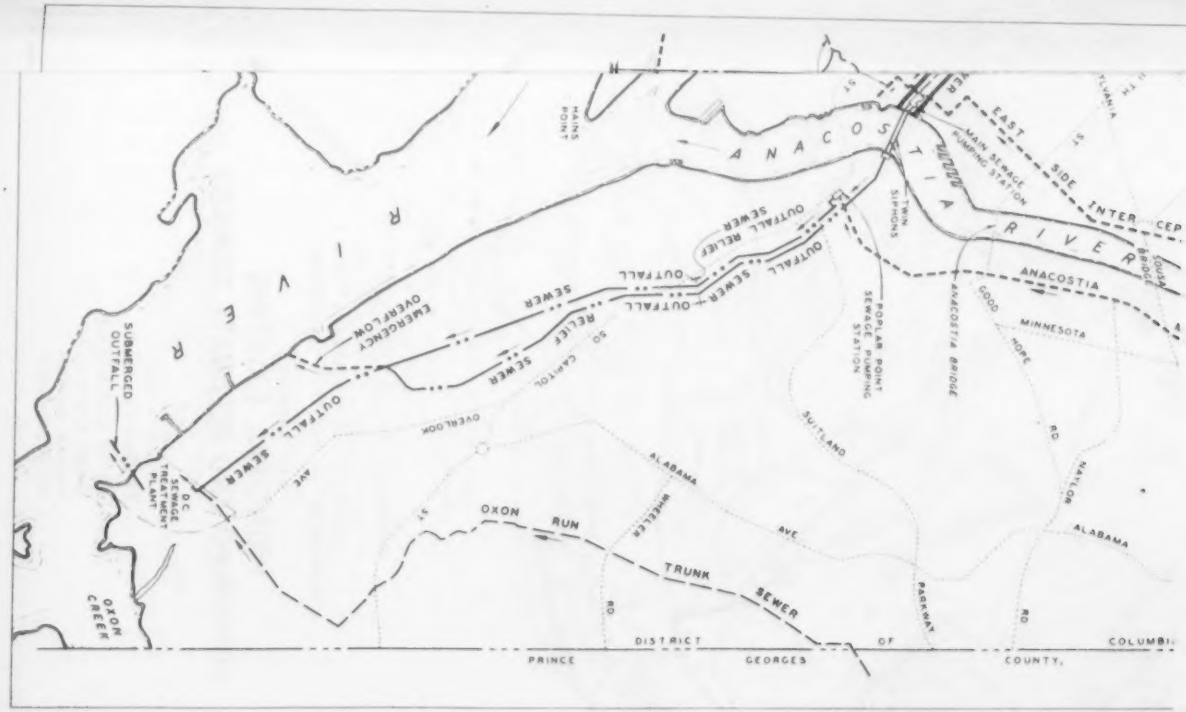
National Capital Planning Commission

To others who, in one way or another, have contributed to this investigation, we express our appreciation.

Throughout the investigation and surveys and the drawing of conclusions on this report and its writing we have had the benefit of the abilities and engineering knowledge of Mr. C. Frank Johnson, our Engineer-Director. A graduate of the University of Kentucky, former Chief Engineer of the Commissioners of Sewerage of the City of Louisville, Kentucky, and the writer of its authoritative Final Report of 1942, Senior Engineer on the staff of Metcalf & Eddy, Engineers, of Boston, Massachusetts, for 13 years, Mr. Johnson has organized and directed the staff in the Washington office of the Board for over 2-1/2 years. His ability and engineering judgment have been of great help to the Board. Excellent service has been received from his staff, which has consisted of Gilmer S. Mustain, Engineer; Harla D. Phillips, Engineer; Roscoe E. Chapman, Draftsman; Robert H. Tolson, Draftsman; and Miss Frances Lowrie, Secretary.

25102 O - 58 (Face p. 148) No. 1

25182 O - 58 (Face p. 148) No. 1



LEGEND

- COMBINED SEWERS 27" AND LARGER
- SEPARATE SEWERS 12" AND LARGER
- DIVERSION SEWERS
- INTERCEPTING SEWERS
- OUTFALL SEWERS TO (AND FROM) SEWAGE TREATMENT PLANT
- DISTRICT OF COLUMBIA BOUNDARY LINE
- STREET LINES

NOTE: THIS MAP INCLUDES THE INTERCEPTING AND DIVERSION SEWERS SHOWN ON FIG. 2.

DISTRICT
DEPARTMENT OF
MAP
PRINCIP
COMBINED AND

2000 0

SCA
FEB
BOARD
SAMU
FRAN
GUST

DISTRICT OF COLUMBIA
RTMENT OF SANITARY ENGINEERING

MAP SHOWING
RINCIPAL EXISTING
ED AND SEPARATE SEWERS

0 2000 4000 6000
SCALE IN FEET
FEBRUARY 1957

BOARD OF ENGINEERS
SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT

NOTES

1. LETTER PREFIXES OF SEWER DISTRICT NUMBERS INDICATE SEWERS TO WHICH THE DISTRICTS ARE TRIBUTARY, AS FOLLOWS:
   - A. UPPER POTOMAC INTERCEPTOR
   - B. WEST ROCK CREEK DIVERSION SEWER
   - C. ROCK CREEK MAIN INTERCEPTOR
   - D. EAST ROCK CREEK DIVERSION SEWER
   - E. B ST.– NEW JERSEY AVE. TRUNK SEWER
   - F. TIDER CREEK TRUNK SEWER
   - G. EAST SIDE INTERCEPTOR
   - H. MARYLAND–ANACOSTIA VALLEY OUTFALL SEWER
   - I. ANACOSTIA MAIN INTERCEPTOR
   - J. OUTFALL SEWER
   - K. OXON RUN TRUNK SEWER

   IN THE CASE OF COMBINED SEWERS, THE ABOVE APPLIES ONLY TO DRY–WEATHER FLOW PLUS DILUTING STORM WATER.
2. MARYLAND–ANACOSTIA VALLEY OUTFALL SEWER IS A PROPOSED SEWER TO BE BUILT IN THE ANACOSTIA MAIN INTERCEPTOR DISTRICT BY WASHINGTON SUBURBAN SANITARY COMMISSION, TO CONVEY SEWAGE FROM MARYLAND AND SEWER DISTRICT H–1 TO DISTRICT OF COLUMBIA OUTFALL SEWER IN VICINITY OF POPLAR POINT SEWAGE PUMPING STATION.
3. PINEY BRANCH AND BUZZARDS POINT INTERCEPTORS ARE NOT SHOWN HEREON AS THEY ARE RELATIVELY UNIMPORTANT.

INDEX OF SEWER DISTRICTS WHERE DISTRICT NAME IS NOT SHOWN ON MAP

NO.	NAME
A–5	RESERVOIR RD.
6	HUTCHINS PL.
10	37 TH ST. – GEORGETOWN
12	K ST. – WISCONSIN AVE.
B–3	O ST.
5	OLIVE ST. – 29 TH ST.
6	M ST. – 27 TH ST.
7	28 TH ST. – WISCONSIN AVE.
C–3	PARKSIDE DRIVE
12	MONTAGUE ST.
19	PIERCE MILL RD.
23	KALORAMA CIRCLE, EAST
24	KALORAMA CIRCLE, WEST
25	N ST. – 28 TH ST.
27	PENN. AVE. – ROCK CREEK
28	K ST. – PENN. AVE.
D–2	PINEY BRANCH SEPARATE SEWER, NORTH
3	PINEY BRANCH SEPARATE SEWER, SOUTH
5	OAK ST. – MT. PLEASANT ST.
6	INGLESIDE TER.
7	PARK RD.
8	LAMONT ST.
9	KENYON ST.
15	BILTMORE ST.
17	26 TH ST. – M ST.
G–6	9 TH ST. – M ST.
8	4 TH ST.
J–2	NAVAL AIR STATION, EAST
4	NAVAL AIR STATION, WEST
6	BOLLING FIELD SEWER, EAST
7	BOLLING FIELD SEWER, WEST

LEGEND

- SEWER DISTRICT BOUNDARIES (HEAVIER LINES INDICATE MAJOR DIVIDES)
- A–8 SEWER DISTRICT NO.
- EXISTING INTERCEPTING AND OUTFALL SEWERS
- EXISTING ROCK CREEK DIVERSION SEWERS
- EXISTING COMBINED SEWERS SERVING AS INTERCEPTORS
- LIMITS OF PRESENT COMBINED–SEWER SYSTEM

25182 O-58 (Face p. 168) No. 2

DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING

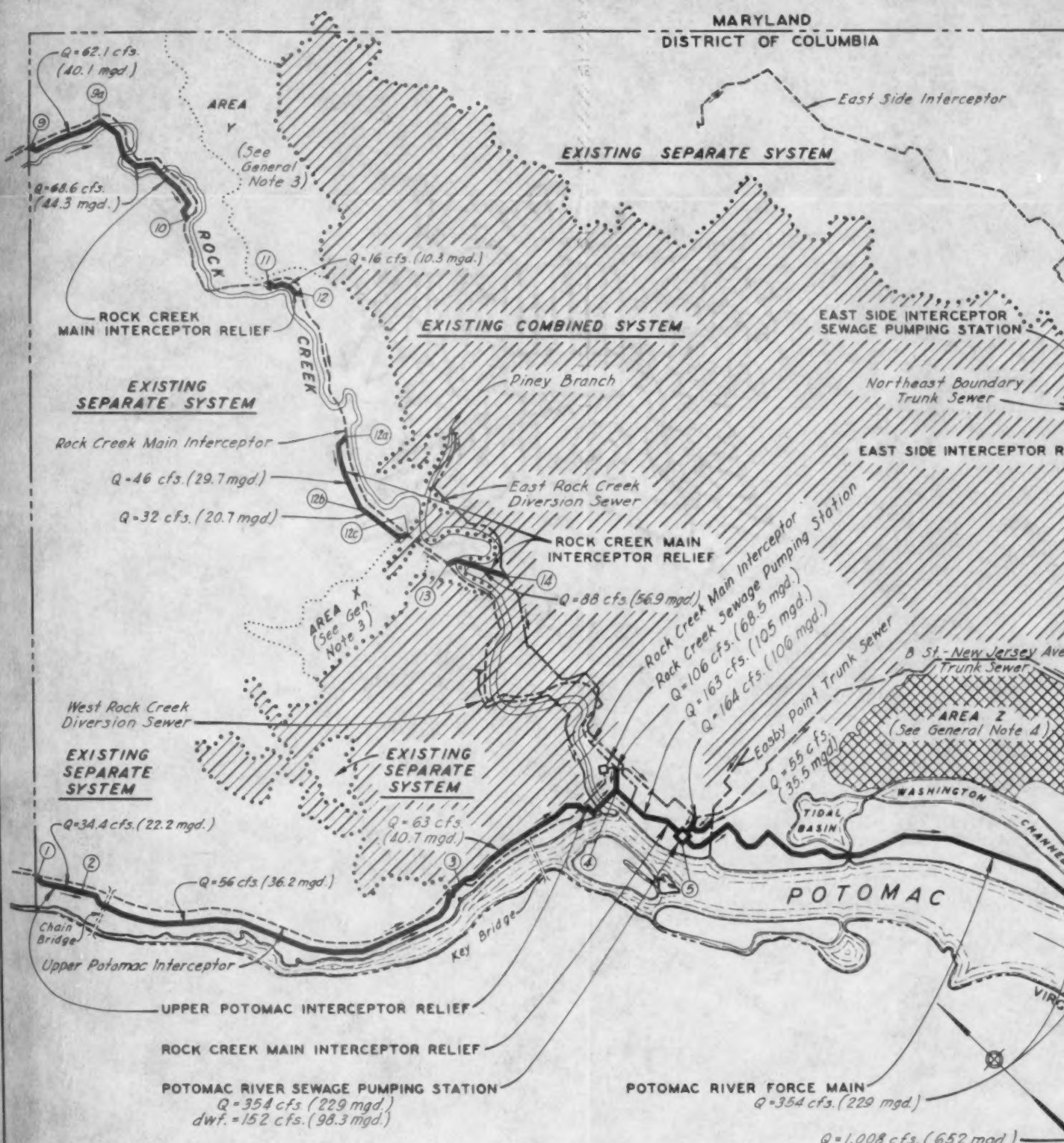
MAP SHOWING

SEWER DISTRICTS
AND
INTERCEPTING AND DIVERSION SEWERS

1500 0 1500 3000 4500 6000
SCALE IN FEET

FEBRUARY 1957

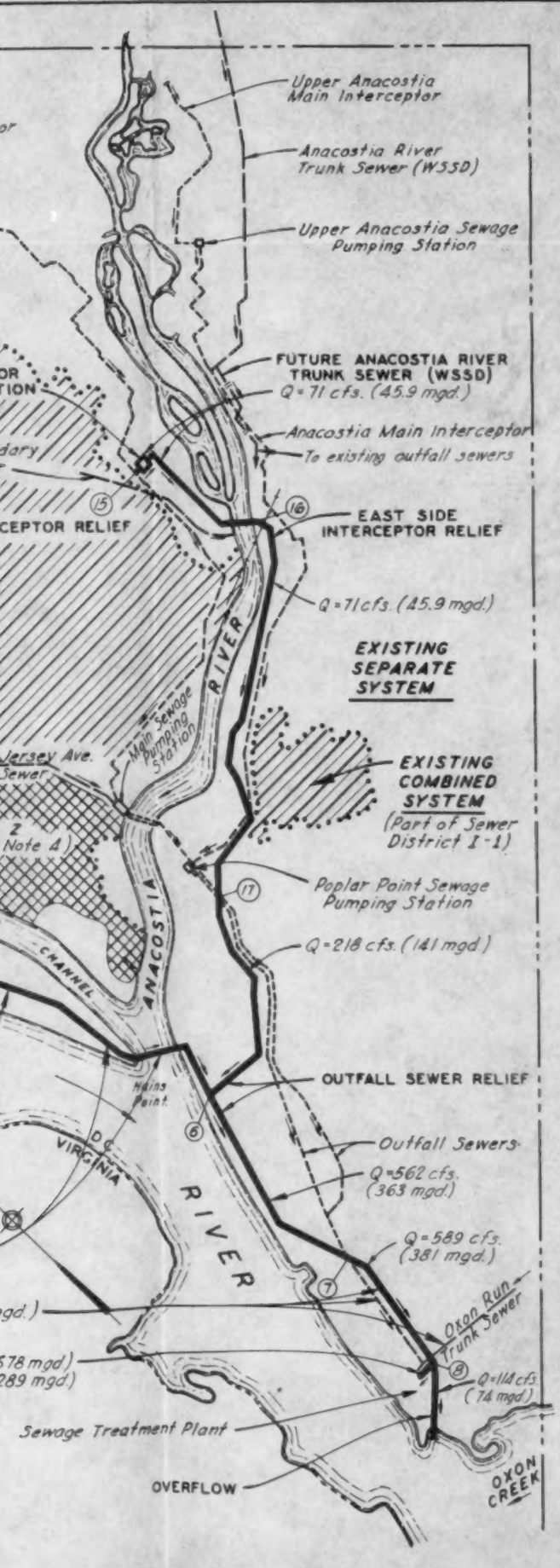
BOARD OF ENGINEERS
SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT


MARYLAND
DISTRICT OF COLUMBIA
Q = 62.1 cfs. (40.1 mgd.)
AREA Y (See General Note 3)
EXISTING SEPARATE SYSTEM
East Side Interceptor
Q = 68.6 cfs. (44.3 mgd.)
ROCK CREEK
Q = 16 cfs. (10.3 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
EXISTING COMBINED SYSTEM
EAST SIDE INTERCEPTOR SEWAGE PUMPING STATION
CREEK
Piney Branch
Northeast Boundary Trunk Sewer
EXISTING SEPARATE SYSTEM
Rock Creek Main Interceptor
EAST SIDE INTERCEPTOR R
Q = 46 cfs. (29.7 mgd.)
East Rock Creek Diversion Sewer
Q = 32 cfs. (20.7 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
Q = 88 cfs. (56.9 mgd.)
Rock Creek Main Interceptor
Rock Creek Sewage Pumping Station
Q = 106 cfs. (68.5 mgd.)
Q = 163 cfs. (105 mgd.)
Q = 164 cfs. (106 mgd.)
AREA X (See Gen. Note 3)
B St - New Jersey Ave. Trunk Sewer
West Rock Creek Diversion Sewer
Easby Point Trunk Sewer
Q = 55 cfs. (35.5 mgd.)
AREA Z (See General Note 4)
EXISTING SEPARATE SYSTEM
EXISTING SEPARATE SYSTEM
WASHINGTON
TIDAL BASIN
Q = 34.4 cfs. (22.2 mgd.)
Q = 63 cfs. (40.7 mgd.)
Q = 56 cfs. (36.2 mgd.)
POTOMAC
Chain Bridge
Key Bridge
Upper Potomac Interceptor
UPPER POTOMAC INTERCEPTOR RELIEF
ROCK CREEK MAIN INTERCEPTOR RELIEF
POTOMAC RIVER SEWAGE PUMPING STATION
Q = 354 cfs. (229 mgd.)
dwf. = 152 cfs. (98.3 mgd.)
POTOMAC RIVER FORCE MAIN
Q = 354 cfs. (229 mgd.)
Q = 1,008 cfs. (652 mgd.)
Estimated Quantity = 894 cfs. (578 mgd.)
dwf. = 447 cfs. (289 mgd.)
D.F. = 2
Sewage

NOTE:
Under Project A, all combined systems would be converted to separate systems.

25182 O-58 (Face p. 148) No. 3

FIG. 14



LEGEND

———	PROPOSED RELIEF INTERCEPTING SEWERS
□	PROPOSED SEWAGE PUMPING STATIONS (OR PROPOSED ADDITION TO CAPACITY OF EXISTING STATION)
- - - - - - - -	EXISTING INTERCEPTING SEWERS
———	EXISTING DIVERSION SEWERS ALONG PINEY BRANCH AND ROCK CREEK
———	CERTAIN OTHER EXISTING SEWERS, PRINCIPALLY THOSE SERVING AS PART OF INTERCEPTING SYSTEM
□	EXISTING SEWAGE PUMPING STATIONS
.....	LIMITS OF EXISTING COMBINED SYSTEM
.....	FORMER LIMITS OF COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM IS NOW INCOMPLETE
▨	EXISTING COMBINED SYSTEM PROPOSED TO BE CONVERTED TO SEPARATE SYSTEM
AREA Z	EXISTING COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D.C. (SEE GENERAL NOTE 4)
②	POINT NO.
Q	REQUIRED CAPACITY, YEAR 2000 (HOURLY OR INSTANTANEOUS PEAK RATE)
cfs.	CUBIC FEET PER SECOND
mgd.	MILLION GALLONS PER DAY OF 24 HR.
dwf.	ESTIMATED YEARLY AVERAGE DRY-WEATHER FLOW, YEAR 2000 (SEE GENERAL NOTE 6)
D.F.	DILUTION FACTOR (YEAR 2000) = $\frac{Q}{dwf.}$
WSSD	WASHINGTON SUBURBAN SANITARY DISTRICT

GENERAL NOTES

1. PROPOSED RELIEF SEWERS SHOWN ARE THOSE WHICH WOULD BE NEEDED PRIMARILY FOR THE EXISTING INTERCEPTING SEWER SYSTEM (THOSE SEWERS WHICH INTERCEPT THE SEWAGE AND CONVEY IT TO THE SEWAGE TREATMENT PLANT), UNDER PROJECT A. RELIEF SEWERS FOR PROJECTS B AND C ARE SHOWN ON FIGS. 15 AND 16, RESPECTIVELY. PROPOSED RELIEFS FOR OTHER EXISTING SEWERS (COMBINED AND SEPARATE) ARE NOT SHOWN. (SEE PLATES 2 AND 3 FOR THE OTHER RELIEF SEWERS).
2. NAMES OF EXISTING SEWAGE WORKS ARE SHOWN IN LOWER-CASE LETTERS; NAMES OF PROPOSED SEWAGE WORKS IN UPPER-CASE LETTERS.
3. AREAS X AND Y HAVE BEEN PARTLY CONVERTED TO SEPARATE SYSTEMS AND ARE TREATED AS SEPARATE-SYSTEM AREAS.
4. AREA Z IS TREATED AS A SEPARATE-SYSTEM AREA, SINCE CONVERSION TO A SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D.C. GOVERNMENT.
5. CAPACITY AND FLOW DATA ARE FOR CONDITIONS ESTIMATED FOR THE YEAR 2000.
6. "DRY-WEATHER FLOW" MEANS ALL FLOW EXCEPT RUNOFF FROM RAINSTORMS.

DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING

PLAN SHOWING ALTERNATE

PROJECT A

FOR

STREAM POLLUTION ABATEMENT

INCLUDING PROPOSED RELIEF INTERCEPTING SEWERS

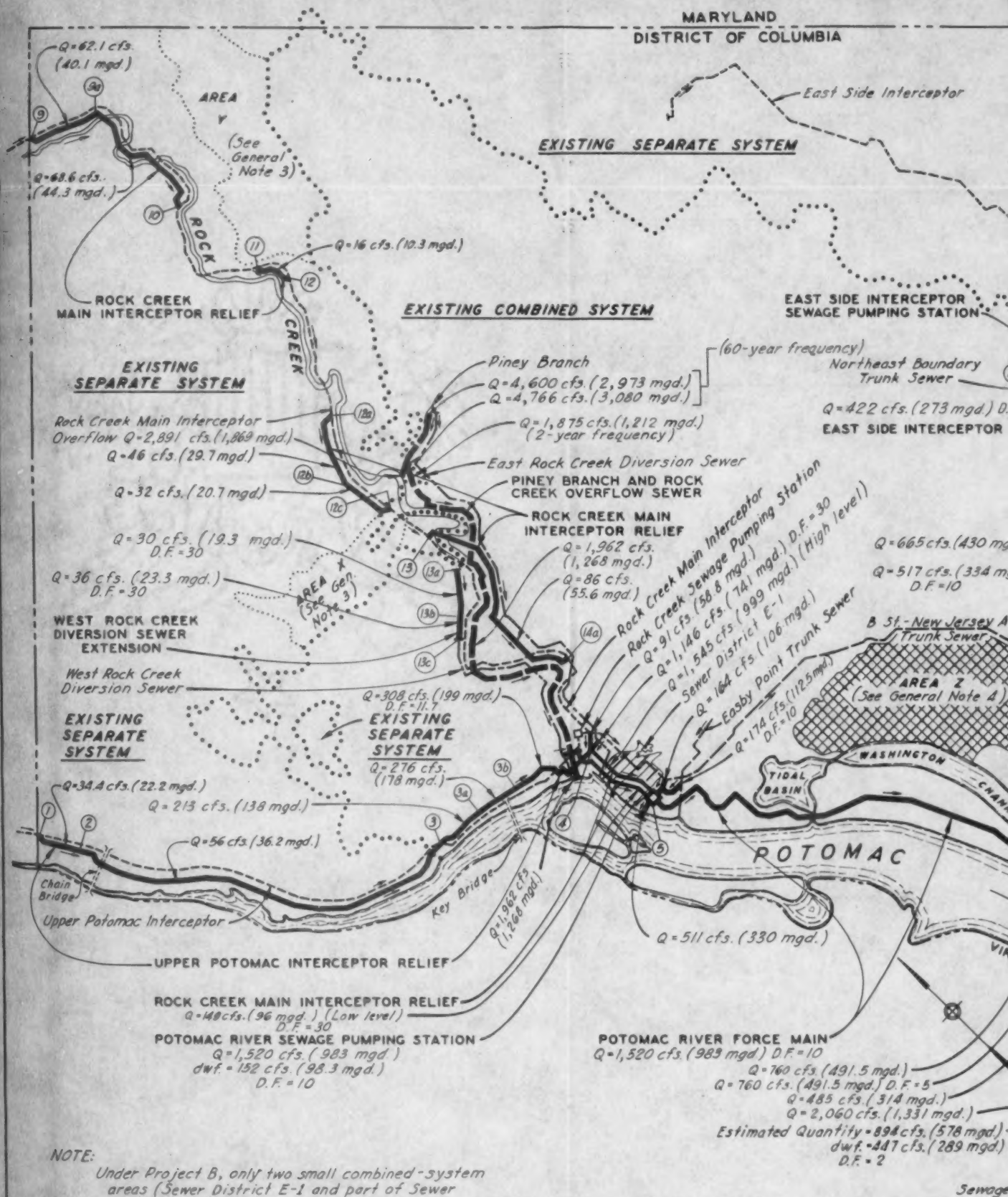
3000 0 3000 6000

SCALE IN FEET

FEBRUARY 1957

BOARD OF ENGINEERS

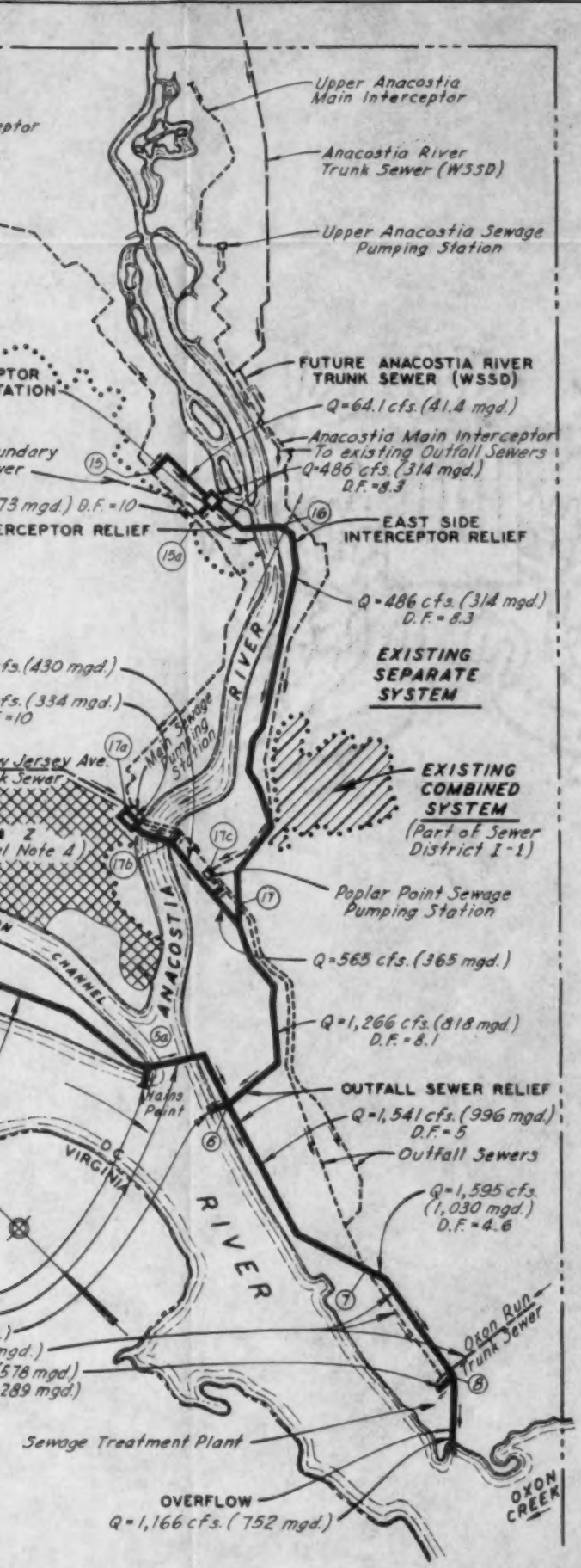
SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT


MARYLAND
DISTRICT OF COLUMBIA
East Side Interceptor
EXISTING SEPARATE SYSTEM
AREA Y
(See General Note 3)
Q=62.1 cfs. (40.1 mgd)
Q=68.6 cfs. (44.3 mgd.)
ROCK CREEK
Q=16 cfs. (10.3 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
EXISTING COMBINED SYSTEM
EAST SIDE INTERCEPTOR SEWAGE PUMPING STATION
(60-year frequency)
Northeast Boundary Trunk Sewer
Q=422 cfs. (273 mgd) D.
EAST SIDE INTERCEPTOR
EXISTING SEPARATE SYSTEM
Piney Branch
Q=4,600 cfs. (2,973 mgd.)
Q=4,766 cfs. (3,080 mgd.)
Q=1,875 cfs. (1,212 mgd.) (2-year frequency)
Rock Creek Main Interceptor Overflow Q=2,891 cfs. (1,869 mgd.)
Q=46 cfs. (29.7 mgd.)
East Rock Creek Diversion Sewer
PINEY BRANCH AND ROCK CREEK OVERFLOW SEWER
Q=32 cfs. (20.7 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
Q=30 cfs. (19.3 mgd.) D.F.=30
Q=1,962 cfs. (1,268 mgd.)
Q=86 cfs. (55.6 mgd.)
Q=36 cfs. (23.3 mgd.) D.F.=30
AREA X (See Gen. Note 3)
Rock Creek Main Interceptor
Rock Creek Sewage Pumping Station
Q=91 cfs. (58.8 mgd.)
Q=1,146 cfs. (741 mgd.) D.F.=30
Q=1,545 cfs. (999 mgd.) (High level)
Sewer District E-1
Q=164 cfs. (106 mgd.)
Easby Point Trunk Sewer
Q=174 cfs. (112.5 mgd.) D.F.=10
Q=665 cfs. (430 mg
Q=517 cfs. (334 mg D.F.=10
B St.-New Jersey A Trunk Sewer
AREA Z (See General Note 4)
WEST ROCK CREEK DIVERSION SEWER EXTENSION
West Rock Creek Diversion Sewer
Q=308 cfs. (199 mgd.) D.F.=11.7
EXISTING SEPARATE SYSTEM
EXISTING SEPARATE SYSTEM
Q=276 cfs. (178 mgd.)
WASHINGTON
TIDAL BASIN
Q=34.4 cfs. (22.2 mgd.)
Q=213 cfs. (138 mgd.)
Q=56 cfs. (36.2 mgd.)
POTOMAC
Chain Bridge
Key Bridge
Upper Potomac Interceptor
Q=1,962 cfs (1,268 mgd.)
Q=511 cfs. (330 mgd.)
UPPER POTOMAC INTERCEPTOR RELIEF
ROCK CREEK MAIN INTERCEPTOR RELIEF
Q=148 cfs. (96 mgd.) (Low level) D.F.=30
POTOMAC RIVER SEWAGE PUMPING STATION
Q=1,520 cfs. (983 mgd) dwf.=152 cfs. (98.3 mgd.) D.F.=10
POTOMAC RIVER FORCE MAIN
Q=1,520 cfs. (983 mgd) D.F.=10
Q=760 cfs. (491.5 mgd.)
Q=760 cfs. (491.5 mgd.) D.F.=5
Q=485 cfs. (314 mgd.)
Q=2,060 cfs. (1,331 mgd.)
Estimated Quantity=894 cfs. (578 mgd.)
dwf.=447 cfs. (289 mgd.)
D.F.=2
Sewage

NOTE:

Under Project B, only two small combined-system areas (Sewer District E-1 and part of Sewer District I-1) would be converted to separate-system areas, as shown, in addition to Area Z.

25182 O-58 (Face p. 146) No. 4



LEGEND

———	PROPOSED RELIEF INTERCEPTING SEWERS
— — —	PROPOSED PINEY BRANCH AND ROCK CREEK OVERFLOW SEWER
□	PROPOSED SEWAGE PUMPING STATIONS (OR PROPOSED ADDITION TO CAPACITY OF EXISTING STATION)
- - - - - -	EXISTING INTERCEPTING SEWERS
——·——	EXISTING DIVERSION SEWERS ALONG PINEY BRANCH AND ROCK CREEK
——·—·——	CERTAIN OTHER EXISTING SEWERS, PRINCIPALLY THOSE SERVING AS PART OF INTERCEPTING SYSTEM
□	EXISTING SEWAGE PUMPING STATIONS
·····	LIMITS OF EXISTING COMBINED SYSTEM
·····	FORMER LIMITS OF COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM IS NOW INCOMPLETE
▨	EXISTING COMBINED SYSTEM PROPOSED TO BE CONVERTED TO SEPARATE SYSTEM
AREA Z	EXISTING COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D.C. (SEE GENERAL NOTE 4)
②	POINT NO.
Q	REQUIRED CAPACITY, YEAR 2000 (HOURLY OR INSTANTANEOUS PEAK RATE)
cfs.	CUBIC FEET PER SECOND
mgd.	MILLION GALLONS PER DAY OF 24 HR.
dwf.	ESTIMATED YEARLY AVERAGE DRY-WEATHER FLOW, YEAR 2000 (SEE GENERAL NOTE 6)
D.F.	DILUTION FACTOR (YEAR 2000) = $\frac{Q}{dwf.}$
WSSD	WASHINGTON SUBURBAN SANITARY DISTRICT

GENERAL NOTES

1. PROPOSED RELIEF SEWERS SHOWN ARE THOSE WHICH WOULD BE NEEDED PRIMARILY FOR THE EXISTING INTERCEPTING SEWER SYSTEM (THOSE SEWERS WHICH INTERCEPT THE SEWAGE AND CONVEY IT TO THE SEWAGE TREATMENT PLANT), UNDER PROJECT B. RELIEF SEWERS FOR PROJECTS A AND C ARE SHOWN ON FIGS. 14 AND 16, RESPECTIVELY. PROPOSED RELIEFS FOR OTHER EXISTING SEWERS (COMBINED AND SEPARATE) ARE NOT SHOWN. (SEE PLATES 2 AND 3 FOR THE OTHER RELIEF SEWERS).
2. NAMES OF EXISTING SEWAGE WORKS ARE SHOWN IN LOWER-CASE LETTERS; NAMES OF PROPOSED SEWAGE WORKS IN UPPER-CASE LETTERS.
3. AREAS X AND Y HAVE BEEN PARTLY CONVERTED TO SEPARATE SYSTEMS AND ARE TREATED AS SEPARATE-SYSTEM AREAS.
4. AREA Z IS TREATED AS A SEPARATE-SYSTEM AREA, SINCE CONVERSION TO A SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D. C. GOVERNMENT.
5. CAPACITY AND FLOW DATA ARE FOR CONDITIONS ESTIMATED FOR THE YEAR 2000.
6. "DRY-WEATHER FLOW" MEANS ALL FLOW EXCEPT RUNOFF FROM RAINSTORMS.

DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING

PLAN SHOWING ALTERNATE

PROJECT B

FOR

STREAM POLLUTION ABATEMENT

INCLUDING PROPOSED RELIEF INTERCEPTING SEWERS

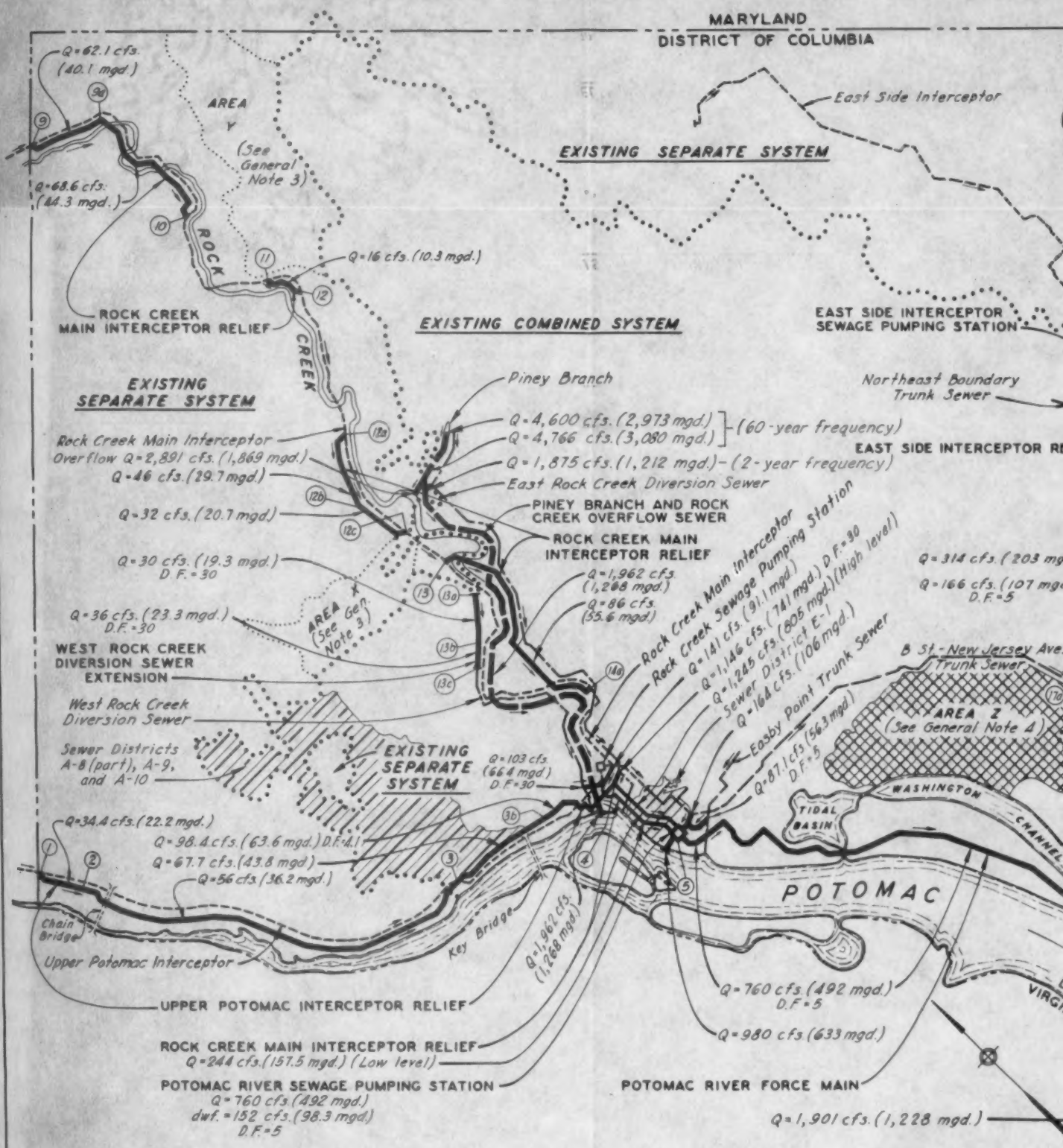
3000 0 3000 6000

SCALE IN FEET

FEBRUARY 1957

BOARD OF ENGINEERS

SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT

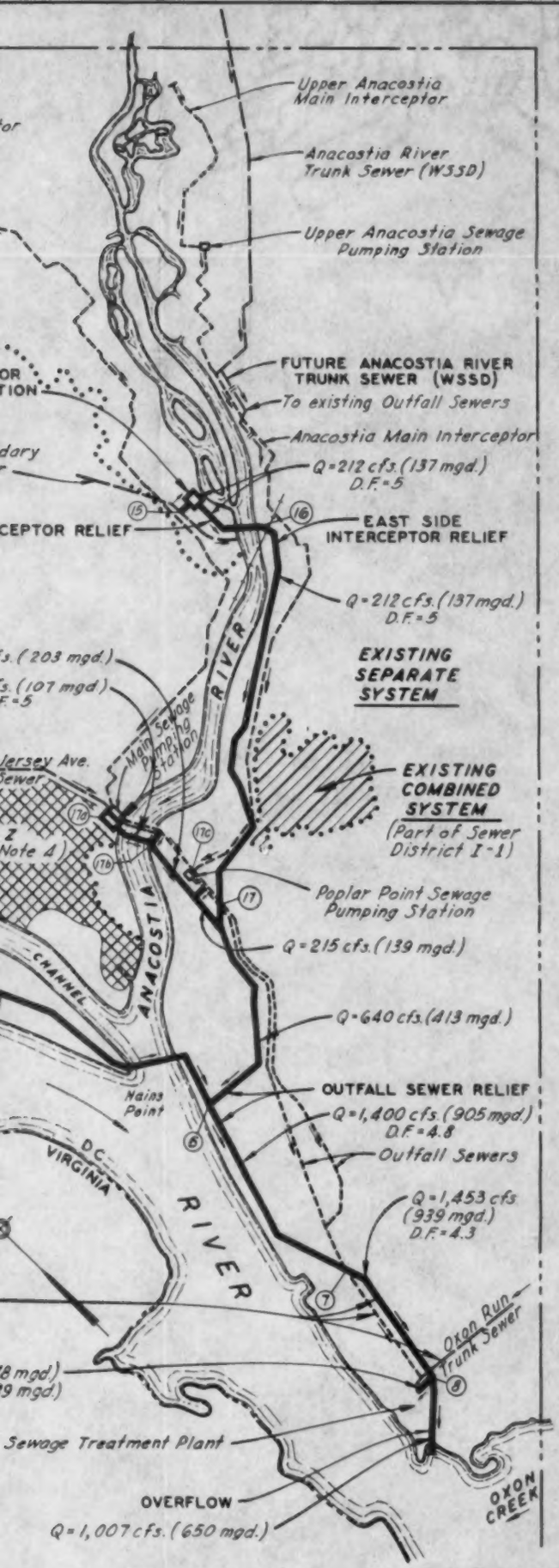

MARYLAND
DISTRICT OF COLUMBIA
Q = 62.1 cfs. (40.1 mgd.)
AREA Y
(See General Note 3)
Q = 68.6 cfs. (44.3 mgd.)
ROCK CREEK
Q = 16 cfs. (10.3 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
EXISTING SEPARATE SYSTEM
East Side Interceptor
EXISTING COMBINED SYSTEM
EAST SIDE INTERCEPTOR SEWAGE PUMPING STATION
EXISTING SEPARATE SYSTEM
Piney Branch
Northeast Boundary Trunk Sewer
Q = 4,600 cfs. (2,973 mgd.)
Q = 4,766 cfs. (3,080 mgd.) (60-year frequency)
Rock Creek Main Interceptor Overflow Q = 2,891 cfs. (1,869 mgd.)
Q = 46 cfs. (29.7 mgd.)
Q = 1,875 cfs. (1,212 mgd.) (2-year frequency)
EAST SIDE INTERCEPTOR RE
East Rock Creek Diversion Sewer
Q = 32 cfs. (20.7 mgd.)
PINEY BRANCH AND ROCK CREEK OVERFLOW SEWER
ROCK CREEK MAIN INTERCEPTOR RELIEF
Rock Creek Main Interceptor
Rock Creek Sewage Pumping Station
Q = 1,962 cfs (1,268 mgd.)
Q = 86 cfs. (55.6 mgd.)
Q = 30 cfs. (19.3 mgd.) D.F. = 30
Q = 314 cfs. (203 mg
Q = 166 cfs. (107 mg D.F. = 5
Q = 36 cfs. (23.3 mgd.) D.F. = 30
AREA X
(See Gen. Note 3)
Q = 141 cfs. (91.1 mgd.)
Q = 1,146 cfs. (741 mgd.) D.F. = 30
Q = 1,245 cfs. (805 mgd.) (High level)
Sewer District E-1
Q = 164 cfs. (106 mgd.)
WEST ROCK CREEK DIVERSION SEWER EXTENSION
B St - New Jersey Ave
Trunk Sewer
West Rock Creek Diversion Sewer
AREA Z
(See General Note 4)
Easby Point Trunk Sewer
Q = 87.1 cfs (56.3 mgd) D.F. = 5
Sewer Districts A-8 (part), A-9, and A-10
EXISTING SEPARATE SYSTEM
Q = 103 cfs (66.4 mgd) D.F. = 30
WASHINGTON
TIDAL BASIN
CHANNEL
Q = 34.4 cfs. (22.2 mgd.)
Q = 98.4 cfs. (63.6 mgd.) D.F. = 4.1
Q = 67.7 cfs. (43.8 mgd.)
Q = 56 cfs. (36.2 mgd.)
POTOMAC
Chain Bridge
Key Bridge
Upper Potomac Interceptor
Q = 1,962 cfs. (1,268 mgd.)
Q = 760 cfs. (492 mgd.) D.F. = 5
UPPER POTOMAC INTERCEPTOR RELIEF
Q = 980 cfs. (633 mgd.)
ROCK CREEK MAIN INTERCEPTOR RELIEF
Q = 244 cfs. (157.5 mgd.) (Low level)
POTOMAC RIVER SEWAGE PUMPING STATION
Q = 760 cfs. (492 mgd.)
dwf. = 152 cfs. (98.3 mgd.)
D.F. = 5
POTOMAC RIVER FORCE MAIN
Q = 1,901 cfs. (1,228 mgd.)
Estimated Quantity = 894 cfs. (578 mgd.)
dwf. = 447 cfs. (289 mgd.)
D.F. = 2
Sewage T
Q =

NOTES:

1. Under Project C, three combined-system areas [Sewer Districts A-8 (part), A-9, A-10, E-1, and part of Sewer District I-1] would be converted to separate-system areas, as shown, in addition to Area Z.
2. See Plate 1, in envelope at back of report, for enlarged plan of proposed relief sewerage works in this Project C.

25182 D-58 (Face p. 148) No. 5

FIG. 16



LEGEND

━━━	PROPOSED RELIEF INTERCEPTING SEWERS
━ ━ ━	PROPOSED PINEY BRANCH AND ROCK CREEK OVERFLOW SEWER
□	PROPOSED SEWAGE PUMPING STATIONS (OR PROPOSED ADDITION TO CAPACITY OF EXISTING STATION)
- - - - -	EXISTING INTERCEPTING SEWERS
—·—	EXISTING DIVERSION SEWERS ALONG PINEY BRANCH AND ROCK CREEK
—·—·—	CERTAIN OTHER EXISTING SEWERS, PRINCIPALLY THOSE SERVING AS PART OF INTERCEPTING SYSTEM
■	EXISTING SEWAGE PUMPING STATIONS
·····	LIMITS OF EXISTING COMBINED SYSTEM
·····	FORMER LIMITS OF COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM IS NOW INCOMPLETE
▨	EXISTING COMBINED SYSTEM PROPOSED TO BE CONVERTED TO SEPARATE SYSTEM
AREA Z	EXISTING COMBINED SYSTEM WHERE CONVERSION TO SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D.C. (SEE GENERAL NOTE 4)
②	POINT NO.
Q	REQUIRED CAPACITY, YEAR 2000 (HOURLY OR INSTANTANEOUS PEAK RATE)
cfs.	CUBIC FEET PER SECOND
mgd.	MILLION GALLONS PER DAY OF 24 HR.
dwf.	ESTIMATED YEARLY AVERAGE DRY-WEATHER FLOW, YEAR 2000 (SEE GENERAL NOTE 6)
D.F.	DILUTION FACTOR (YEAR 2000) = $\frac{Q}{dwf.}$
WSSD	WASHINGTON SUBURBAN SANITARY DISTRICT

GENERAL NOTES

1. PROPOSED RELIEF SEWERS SHOWN ARE THOSE WHICH WOULD BE NEEDED PRIMARILY FOR THE EXISTING INTERCEPTING SEWER SYSTEM (THOSE SEWERS WHICH INTERCEPT THE SEWAGE AND CONVEY IT TO THE SEWAGE TREATMENT PLANT), UNDER PROJECT C. RELIEF SEWERS FOR PROJECTS A AND B ARE SHOWN ON FIGS. 14 AND 15, RESPECTIVELY. PROPOSED RELIEFS FOR OTHER EXISTING SEWERS (COMBINED AND SEPARATE) ARE NOT SHOWN. (SEE PLATES 2 AND 3 FOR THE OTHER RELIEF SEWERS).
2. NAMES OF EXISTING SEWAGE WORKS ARE SHOWN IN LOWER-CASE LETTERS; NAMES OF PROPOSED SEWAGE WORKS IN UPPER-CASE LETTERS.
3. AREAS X AND Y HAVE BEEN PARTLY CONVERTED TO SEPARATE SYSTEMS AND ARE TREATED AS SEPARATE-SYSTEM AREAS.
4. AREA Z IS TREATED AS A SEPARATE-SYSTEM AREA, SINCE CONVERSION TO A SEPARATE SYSTEM HAS BEEN AUTHORIZED BY D.C. GOVERNMENT.
5. CAPACITY AND FLOW DATA ARE FOR CONDITIONS ESTIMATED FOR THE YEAR 2000.
6. "DRY-WEATHER FLOW" MEANS ALL FLOW EXCEPT RUNOFF FROM RAINSTORMS.

DISTRICT OF COLUMBIA
DEPARTMENT OF SANITARY ENGINEERING

PLAN SHOWING ALTERNATE

PROJECT C

FOR

STREAM POLLUTION ABATEMENT

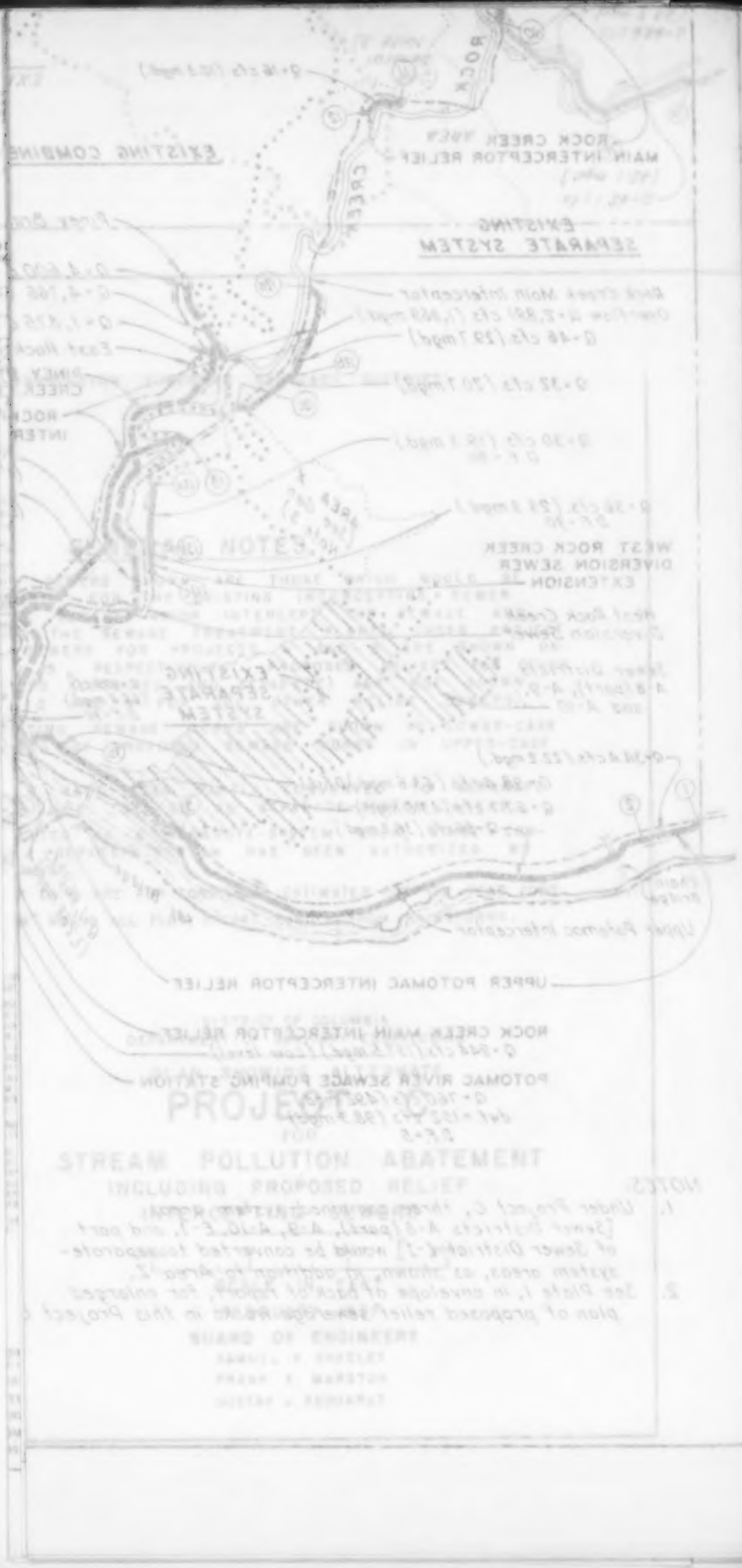
INCLUDING PROPOSED RELIEF INTERCEPTING SEWERS

3000 0 3000 6000

SCALE IN FEET

FEBRUARY 1957

BOARD OF ENGINEERS
SAMUEL A. GREELEY
FRANK A. MARSTON
GUSTAV J. REQUARDT



Mr. AULD. As of a year ago, this was estimated to cost $71,433,000. Under the board's plan, this system would accommodate Maryland flows to be expected from the areas of the present Washington Suburban Sanitary District, approximately the same area you see in light green color on Mr. Watt's map—it is on the Maryland side.

The system can and should be increased in size to provide for the sewage from areas even farther upstream which would naturally drain toward the Potomac above the water intake. This is suggested by Dr. Wolman.

This would furnish the lower section of a permanent system for the disposal of sewage wastes originating in the upper portions of the metropolitan area whose threat is now of universal concern. To prevent serious overflows from the existing District system, to be expected within from 8 to 10 years, notwithstanding local improvements now under way and proposed, the basic elements of project C should be in service within from 8 to 10 years.

The District's resources are not adequate to perform this work at the necessary rate and we are therefore faced with a serious problem for which some financial solution must be found.

A recognition of the Federal interest and responsibility in the metropolitan area with commensurate financial contribution to this system and possibly a continuation of it upstream from the District could provide a workable answer.

Mr. HYDE. Right there, Mr. Auld—I understand with respect to Federal interest and responsibility, you ar talking about this needed $71,433,000 for the construction of this combined sewage system?

Mr. AULD. Yes, sir.

Mr. HYDE. In the past, as you have already indicated in your report, your sewage system has been financed for the most part by the District of Columbia itself?

Mr. AULD. Entirely.

Mr. HYDE. With the exception of these small amounts that you say came from Federal funds, such as the $3 million out of the $33 million for the Dalecarlia project, and whatever the figure was for the other project that you mentioned.

Now, this combined sewer system will be, as I get it from your testimony, integrated into your water and sewage system; is that correct?

Mr. AULD. Sewer system.

Mr. HYDE. It will enter the sewer system. To what extent do you think that should be financed locally? What I am getting at is I anticipate difficulty such as we have had in the past on the floor of the House, about Federal moneys for local projects. And you make an argument here that this is a Federal interest and responsibility. Now, we are going to need some pretty persuasive arguments to show the Federal responsibility, at least to a greater extent than it has been exercised in the past.

Mr. AULD. I am seeking here to establish only that there is a degree of Federal responsibility, but not for the whole thing. The municipal sewer system, except for the receipt of certain grants under, say WPA and PWA, works programs many years ago, which were received by all municipalities—except for that—has a system paid exclusively from municipal revenues, most of it general funds—that is, from taxes.

What we propose here, what must be done, is a relief of that system which is overloaded by growth, it was not designed for all time, and the accommodiation of flows originating outside the District of Columbia.

Now, between the District of Columbia and Washington Suburban Sanitary Commission at this time there is an agreement which each shares pro rata in the cost of any facility built for common service. (The text of this agreement is printed below.) Some part of the cost of this, would, under that agreement, become an obligation of the Sanitary Commission. Should any area in Virginia choose to use this as a way of reaching our treatment plant, a similar contractual arrangement could be made to apply there and some part of it be absorbed by the Virginia beneficiary.

What I am simply suggesting is that over and beyond what would be local participation in this, there might well and properly be Federal participation, partly because of the timing. We can municipally build this in from 18 to 20 years, with our expected resources. But I say that between 8 and 10 years from now we will have so fully outgrown present lines that we will have a pollution problem as we have not seen before. It is the acceleration which I would suggest that the United States attempt to take care of.

Mr. HYDE. Well, this same acceleration is going on in other metropolitan areas. Parenthetically, I may add that what I am saying here now is somewhat like the questions on Meet the Press—it does not necessarily reflect my views, but it is an attempt to get information.

This same acceleration is going on in other large metropolitan areas. Now, to what extent can we argue that the Federal responsibility here is any more than it is in other metropolitan areas throughout the United States?

Mr. AULD. I couldn't give you a quantitative answer. But look, if you will, at the selection of sites for Federal developments which, for the most part, have been above the city, when they might perhaps just as well have been below. By the very selection of these locations, problems have been created which might have been avoided.

So, with the satellite growth which will be attracted by these Federal agencies, I think we hasten the day when growth will be into regions for which there are now no sewage facilities, and that, I think, brings it on us sooner than we might find it otherwise. And it is the speedup which is our problem, in financing.

Mr. HYDE. I will not press that any further at this time, Mr. Chairman. Thank you.

Senator BIBLE. All right, Mr. Auld—if you will proceed with your statement.

Mr. AULD. It is to be hoped that the local jurisdictions can finance local collection systems, as in the past. The continued effective operation of the several major downstream Virginia sewage-treatment plants, with expansion as needed and the extension of their tributary sewer systems as growth may require, would appear to provide a reasonable method of sewage disposal for most of the presently developed territory without any necessarily consequential detriment to the Potomac. To repeat, my greatest concern is for adequate disposal of sewage from the upriver areas, and I urge your committee to give this its most serious attention.

Senator BIBLE. Thank you very much, Mr. Auld.

It is about time to recess for the noon hour. Might I ask you whether your schedule is such that you could return this afternoon at 2 o'clock? I anticipate there may be some questions of you.

Mr. AULD. Thank you. I would be delighted to come back at your disposal any time.

Senator BIBLE. Very fine. I might just ask one question before we break up for the noon recess. Do I understand that you see no need of a regional authority to handle the water problems? Is that a correct conclusion?

Mr. AULD. I qualified that statement by saying for operational responsibility within the States and the District. In Mr. Levin's papers, they alluded to several levels of authority. And I feel that, in discussions of authority, we are inclined to be confused as to at what level the authority might have application. What I have defined here is what I would call the lowest level, the operational one.

Senator BIBLE. By operational you mean distribution?

Mr. AULD. Yes, sir.

Senator BIBLE. Well, now, does the same type of conclusion go to this sewage-disposal problem that we have before us?

Mr. AULD. Yes. Operationally, I don't think we need a transcendent authority to collect sewage.

Senator BIBLE. You are talking about the entire metropolitan area now. You are not confining your remarks to the District of Columbia?

Mr. AULD. No; metropolitanwise.

Mr. HYDE. Well, does that extend to the matter of controlling the pollution in the river itself?

Mr. AULD. To a large measure; yes.

Mr. HYDE. Well, to carry that a bit further, you point out on page 2 of your remarks that you find yourself in competition with future millions of the area for the river's resources, which will be insufficient unless carefully developed and controlled. Now, doesn't that apply not just to the metropolitan area, but to the local river basin?

Mr. AULD. It goes across the board.

Mr. HYDE. And, for example, doesn't the more intensive use of the waters of the Potomac for agricultural purposes affect the supply rather seriously in the future?

Mr. AULD. It is a great threat.

Mr. HYDE. So, what is done 20, 30, 40, 50 miles upriver greatly affects your supply in the Washington metropolitan area; is that not true?

Mr. AULD. That is correct.

Mr. HYDE. And so, wouldn't that, in your opinion, indicate some need for a regional approach to these problems administratively?

Mr. AULD. I have not attempted to go into that. Have you time?

Senator BIBLE. I can anticipate that we may be getting into an area that will take some time—when you said have we time, with alarm.

Mr. AULD. That is why I asked you.

Senator BIBLE. Can you answer this one question just in a few sentences?

Mr. AULD. I would like to make a longer answer.

Senator BIBLE. I see you are just as anxious to get to lunch as I am. I don't blame you one bit, Mr. Auld.

Suppose we recess at this time, at the call of the Chair, until 2 o'clock.

(Whereupon, at 12:05 p. m., the hearing was recessed, to reconvene at 2 p. m., the same day.)

AFTERNOON SESSION

Representative HYDE. I believe when we concluded, at the noon recess, you were going to proceed further with the answer to this question regarding regional organization one way or another. Would you just proceed with where you left off?

STATEMENT OF DAVID V. AULD—Resumed

Mr. AULD. Thank you, Mr. Chairman. I will be glad to do it. I am afraid in some proceeding I may simply demonstrate I have no convictions on the problem at all as to what the probable answer should be.

I have looked at the matter of authorities regionally and area-wide with increasing attention over the last few years. It has been very much before us, and in my relationship to the interstate relationship of the Potomac River Basin, as Chairman of its Compact Revision Committee, I have been placed face to face with it. I think the most that I have come out with has been a better understanding of the problem without the full solutions for it.

I recognize, for example, that we have State sovereignties throughout the basin, States rights, and interests which are very deep, and that a disturbance of those always make difficulties.

I think you also find within the States and local areas a natural reluctance to relinquish those rights, whatever they may be. And, in face of that, it seems especially difficult to try to conduct any type of authority which is effective on the one hand and acceptable on the other. That is the dilemma in which I find myself.

Starting at the bottom, at the operating level that we were discussing earlier, neither in water distribution nor in sewage collection do I see any requirement for a regional authority, somebody to expand the jurisdiction with that type of function. I think that it is local, a service which any community might wish to add at its own selection.

In water production, there is the purification of water, and I feel we at first approach a time when some larger, possibly corporate, entity might have advantages for financial responsibility. We, of course, enjoy that right now in the Dalecarlia plant as part of the municipal water system, and, by contract, we are able to supply other jurisdictions.

Representative HYDE. Right there, Mr. Auld, to what extent do these other jurisdictions participate in the moneys for capital outlays for the construction of something like Dalecarlia?

Mr. AULD. Heretofore, they have not participated at all. The problem has rested with the District of Columbia to capitalize what has been done.

Representative HYDE. Don't you think that is something we should face in the future?

Mr. AULD. I think we should.

Representative HYDE. Don't you think the District should continue to be put upon for the capital expenditures for such facilities in the future.

Mr. AULD. No. We have faced that, however, in a similar arrangement involving sewage disposal in the District.

This time it does not involve Virginia, but Maryland, and there, by contract, the Maryland authorities and ourselves have undertaken the problem of each capitalizing in proportion to his degree of interest in the common facility, whatever it is, and I think that is going to work out very well.

For example, the Blue Plains treatment plant is now being expanded. Its basis of design is the year 1980 for flows in the sanitary commission and ourselves.

The calculations indicate that about 36 percent of the load will come from Maryland, and they are contracting to accept 36 percent of the capital cost of that improvement.

As a matter of fact, the sanitary commission has paid cash on the barrelhead for their part of what we have gone into so far. That may seem awkward for a regional approach, but it has been worked out, I think, very well, and by the way, could I put a copy of that agreement into the record sometime?

Representative HYDE. Yes, indeed, you may. We can have it inserted at this point in the record.

Mr. AULD. I would like to offer it for the record. Thank you. I will supply it later.

(The document is as follows:)

AGREEMENT No. DCF–A–

THIS AGREEMENT, made in quintuplicate this 12th day of August, Nineteen Hundred and Fifty-Four, by and between the COMMISSIONERS OF THE DISTRICT OF COLUMBIA and the WASHINGTON SUBURBAN SANITARY COMMISSION, a body corporate created under the laws of the State of Maryland,

WITNESSETH:

Whereas the Congress of the United States, by an Act approved September 1, 1916 (39 Stat. 717), authorized the connection of Maryland sewers and sewerage systems with the sewerage systems of the District of Columbia, for the protection of streams flowing through United States government parks and reservations in the District of Columbia from pollution by sewage, and authorized the said Commissioners of the District of Columbia to enter into agreements, under certain terms and conditions, with the proper authorities of the State of Maryland in relation thereto; and

Whereas the General Assembly of the State of Maryland by an Act known as Chapter 122 of the Acts of 1918, as amended, created the Washington Suburban Sanitary Commission, a body corporate, and by virtue of said Act and of other laws in force in the State of Maryland said Commission was and is authorized to take over existing sewerage systems within designated areas bordering upon the District of Columbia and operate the same, and to construct and operate additional systems and to enter into contracts and agreements with the Commissioners of the District of Columbia for the connection of said systems with the sewerage systems of the District of Columbia and concerning any other matter necessary, advisable or expedient for the proper construction, maintenance and operation of the water supply, sewerage, drainage or refuse disposal systems under its control or those under the control of the Commissioners of the District of Columbia, which said contracts and agreements have the full force and effect of contracts between the District of Columbia and the State of Maryland; and

Whereas the said Commissioners of the District of Columbia and the said Washington Suburban Sanitary Commission did enter into certain agreements dated June 3, 1924, and July 27, 1926, under the authority of the aforesaid Acts of the Congress of the United States and of the General Assembly of the State of Maryland, pursuant to which agreements the said Washington Suburban Sanitary Commission constructed and provided connecting sewers, as necessary, to discharge sewage from the aforementioned areas into certain of the sewerage systems of the District of Columbia in such manner as to free certain of the streams entering the District of Columbia from pollution by sanitary sewage; and

Whereas the great increase in population of the areas of Maryland which normally do or would discharge sewage into streams which flow through United States government parks and reservations in the District of Columbia, and the corresponding actual and potential increase in the quantity of sewage which does and will discharge into the sewerage systems of the District of Columbia and into said streams, requires that the agreements between the parties hereto be revised and superseded by this new agreement.

Now, therefore, in consideration of the premises, and of the mutual benefits to be derived therefrom, and of the respective undertakings, promises, and covenants of the parties hereto as hereinafter contained, the Commissioners of the District of Columbia, hereinafter called "District", hereby agree to permit the connection of sewers and sewerage systems in Maryland and under or subject to the jurisdiction of the Washington Suburban Sanitary Commission, hereinafter called "Commission", with the sewerage systems of the District, and to handle, pump and treat all sewage delivered to the District of Columbia sewerage systems through each connection therewith of a sewer or sewerage system from Maryland properties or Commission sewers or sewerage systems, and the Commission agrees to permit the connection of sewers and sewerage systems in the District of Columbia and under or subject to the jurisdiction of the District with sewers and sewerage systems of the Commission, under the following terms and conditions:

SECTION 1. (A) Every connection of a sewer of either party hereto to a sewerage system of the other party shall be made at or near the District line at such points as the natural drainage of the areas to be sewered require, each such connection to be made upon the basis of prior agreement between the Director of Sanitary Engineering, D. C., and the Chief Engineer of the Commission.

(B) Any property lying in Maryland and abutting a District of Columbia sanitary service sewer, shall be permitted to connect with the said District service sewer upon written application to, and written consent from, the Department of Sanitary Engineering, D. C., provided such connection is made in accordance with District of Columbia regulations and that payment be made by the Commission to the Collector of Taxes, D. C., of an amount equal to the charge or assessment which, if the property to be connected were located in the District of Columbia, would be made by the District of Columbia pursuant to laws or regulations in force in the District of Columbia at the time permission to make such connection is given, without regard to the amount of any assessment or charge the Commission may collect for itself from the owner of such property for said connection.

(C) Any property lying within the District of Columbia shall be permitted to connect with a Commission sanitary service sewer upon written application to, and written consent from, the Commission, provided such connection is made in accordance with Commission regulations and that payment is made to the Commission by the person applying for such permission of an amount calculated on the same basis as the amount which would be paid by the Commission to the District of Columbia on behalf of a similar Maryland property making a connection to the sewerage system of the District of Columbia at such time.

SECTION 2. The Commission, as to its sewers draining into the sewerage systems of the District, and the District, as to its sewers draining into the sewerage systems of the Commission, shall prevent insofar as possible the passage of any drainage other than sanitary sewage or wastes not detrimental to the sewerage systems or treatment processes, and shall use every practicable precaution in construction and in regulations governing the use of sewers and sewerage systems to exclude therefrom surface water or rain water except from areaways and depressed driveways which may be drained in accordance with the plumbing regulations applicable in such jurisdiction.

SECTION 3. (A) Sewers of the Commission which discharge into the sewerage systems of the District shall be provided with sewage flow meters whenever the

use of such meters is practicable. The practicability of metering, and the size and type of meter and the location thereof, shall, in each instance, be determined by agreement of the Engineers of the parties hereto. The entire cost of each meter installation shall be borne by the Commission.

(B) Each sewage flow meter shall be operated and maintained by the party hereto within whose jurisdiction such meter is located, but all costs of such operation and maintenance shall be paid by the Commission, and both parties may participate from time to time in joint readings of all sewage meters and in joint inspections of such meters.

(C) In case a sewage flow meter fails to function from any cause, the sewage flow for the period of such failure shall be considered as equal to the flow as determined during the most recent corersponding period the meter was in satisfactory operation, and if there is no such corresponding period the flow shall be determined or estimated in such manner as shall be agreeable to the Engineers of the parties hereto.

SECTION 4. (A) The Commission shall pay annually to the District the actual costs to the District of handling, pumping and treating all sewage delivered to the District sewerage systems through each connection therewith of a sewer or sewerage system of the Commission or of a Maryland property. Such payments, denominated "sewage flow charges," shall consist of the following amounts:

(1) An amount (herein called "Number 1 Sewage Flow Charge Amount") equal to such portion of the total operation, repair and maintenance costs, including overhead, of each District facility which handles sewage from Maryland as the total annual flow of Maryland sewage in the particular facility bears to the total annual flow of all sewage in such facility. The annual costs of operation, repair and maintenance shall be determined from the records of actual costs of operation and maintenance which are kept by the District with respect to each facility. Said records shall be subject to inspection by the Commission or its duly authorized agent. To the total of these costs for each facility shall be added four percent (4%) thereof as overhead.

(2) An amount (herein called "Number 2 Sewage Flow Charge Amount") with respect to each District facility, exclusive of lateral branches conveying sewage to interceptors, constructed or for the construction of which funds were obligated prior to July 1, 1954, which handles sewage from Maryland, such payment to be a sum equal in the case of—

a. Interceptors, to one percent (1%).
b. Buildings, to one and one-half percent (1½%).
c. Equipment, to four percent (4%).

of the Commission's proportionate share of the value of each such facility. As used herein the Commission's proportionate share of the value of each District facility shall be such portion of the total cost to the District of each such facility as the total annual flow of Maryland sewage in the particular facility bears to the total annual flow of all sewage in such facility.

At such time as any facility as to which the Number 2 Sewage Flow Charge Amount is being paid shall be abandoned, or replaced by another facility toward the cost of whose construction the Commission shall have paid its proportional share as hereinafter provided, the further payment of the Number 2 Sewage Flow Charge Amount with respect to such original facility shall cease.

(B) The Commission shall pay to the District the Commission's share of the cost of restoring or replacing each District facility, exclusive of lateral branches conveying sewage to interceptors, which handles sewage from Maryland. Upon the restoration or replacement of any such facility, or part thereof, the District will charge the Commission's share of the actual cost of such restoration or replacement to a "Receivable" account as described in Section 6.

(C) The Commission's share of the cost of restoration or replacement, as used in subsection (B) hereof, shall be so much of the actual cost to the District of restoring or replacing such facility, or part thereof, as the maximum design capacity assigned to the Commission bears to the maximum design capacity assigned to both parties with respect to such facility, or part thereof, as restored or replaced. The maximum design capacity assigned to each party shall be such maximum capacity at peak flow as each such party notifies the other party it desires incorporated in the restored or replaced facility and which shall be actually incorporated in the design thereof. In the event the District shall

notify the Commission that restoration or replacement of a facility or part thereof is intended and the Commission fails to notify the District of the maximum design capacity which the Commission desires to have incorporated in such facility, or part thereof, the Commission shall be deemed to have requested a maximum design capacity sufficient only to accommodate the greatest actual peak flow of Maryland sewage through such facility, or part thereof, prior to the date restoration or replacement work is commenced.

(D) Recognizing that through parts of its length the Oxon Run Interceptor Sewer is situated in the District and through other parts of its length this same sewer is situated in Maryland, and recognizing that sewage originating in the District is conveyed through the portions of this sewer situated in Maryland and sewage originating in Maryland is conveyed through the other portions of this sewer situated in the District, it is hereby agreed, any provision in Section 4 (A) to the contrary notwithstanding, that the charges payable by the Commission for Maryland sewage flows therein shall be as follows:

(1) The Number 1 Sewage Flow Charge Amounts shall be based on the flows measured by sewage meter, the flows so metered to be allocated between the District and the Commission in proportion to the number of sewage units as defined in Section 8 hereof as are served in the respective jurisdictions upstream from the said sewage meter.

(2) No Number 2 Sewage Flow Charge Amounts shall be paid with respect to the existing Oxon Run Interceptor Sewer.

The Commission shall pay its proportional part of the cost of replacement of those portions of the said sewer situated in the District and carrying sewage originating in Maryland. The District shall pay its proportional part of the cost of replacement of those portions of the said sewer situated in Maryland and carrying sewage originating in the District.

SECTION 5. (A) Whenever it may become necessary for either party to plan an extension of its sewerage system which would result in the delivery of materially increased sewage flows into existing sewers of the other party, the party contemplating such extension shall submit to the other party general information as to said contemplated work, including estimates of the increased flows resulting therefrom, for certification as to the availability of the other party's system to handle the increased flow.

It is understood that the effect of routine service sewer extensions will not be construed as resulting in the delivery of materially increased flows, in the sense of this subsection; however, not less often than once each year the Engineer of each party hereto shall furnish the Engineer of other party his best estimate as to the average and maximum quantities of sewage anticipated during the next succeeding year to be delivered through each of the major connections to the sewerage system of the other.

(B) Whenever it shall become necessary to add any facilities to the sewerage systems of either party to this Agreement in order to receive, handle, pump, or treat sewage received from the other party, such facilities shall be constructed or installed as promptly as practicable. The cost of such work (exclusive of lateral branches conveying sewage to interceptors) shall be shared by the parties hereto as provided in subsection (D) hereof. In the event of shortage of funds, the parties agree to attempt to obtain funds as quickly as possible for the purpose of constructing or installing such facilities. Neither party shall be obligated to commence construction or installation of any additional facilities until (1) the other party has made its share of the cost available to the constructing party or has otherwise satisfied the constructing party that funds will be available on demand, as may be mutually agreed at the time, and (2) the constructing party has available sufficient funds (including funds which the other party has already made available or will make available on demand) to pay all estimated costs of such facility. All money paid to the District by the Commission as its share of construction costs under this Section 5 shall be credited to an appropriate "Receivable" account as described in Section 6, and all construction costs properly chargeable to the Commission shall be charged to an appropriate "Receivable" account.

(C) In the event the District proposes to construct or to install a new facility (exclusive of lateral branches conveying sewage to interceptors) which will or may handle sewage from Maryland, the District will advise the Commission of all pertinent facts concerning such proposed construction or installation. The Commission shall promptly advise the District whether it desires the District to incorporate in such facility any capacity for the handling of Maryland sewage,

and if so, state what maximum capacity at peak flow it desires, and furnish therewith all necessary design data. The District will construct any such proposed facility of such capacity to make available to the Commission for the handling of Maryland sewage the requested maximum capacity at peak flow in accordance with time elements as specified by the Commission in its design data furnished to the District. Prior to construction the District will notify the Commission of the maximum capacity at peak flow in accordance with time elements specified by the District for which the facility has been designed for handling District sewage (without making provision for any capacity for the handling of Maryland sewage, whether Maryland sewage will actually flow in the same or in another facility), which shall be deemed "the maximum design capacity assigned" to the District with respect thereto.

(1) In the event Maryland sewage will actually flow through the new facility, the requested maximum capacity, at peak flow in accordance with time elements as specified by the Commission in its design data furnished to the District, shall be deemed the "maximum design capacity assigned" to the Commission with respect thereto.

(2) In the event Maryland sewage will not actually flow through the new facility and the Commission requests the District to construct it of sufficient capacity to increase the availability of another facility for the carriage of Maryland sewage, the maximum capacity, at peak flow in accordance with time elements specified by the Commission in its design data furnished to the District, by which the availability of the other facility for actual carriage of Maryland sewage is increased, shall be deemed the "maximum design capacity assigned" to the Commission with respect to the new facility.

The costs of construction shall be shared by the parties as provided in subsection (D) hereof.

In the event the Commission pays its proportionate share of the cost of a new facility through which Maryland sewage will not actually flow, but whose construction will increase the availability of another facility for the carriage of Maryland sewage, as described above, then the District will credit the amount of such payment to the appropriate "Receivable" account for the restoration or replacement of the facility whose availability for the carrying of Maryland sewage has thus been increased but such credit shall never be available for application to any other facility.

(D) The cost of each facility constructed or installed under this section shall be paid by the parties hereto in the same proportions as the maximum design capacity assigned to each party with respect to such facility bears to the total maximum design capacity assigned to both parties with respect to such facility. Except as provided in subsection (C) hereof, the "maximum design capacity" assigned to each party with respecet to each facility constructed or installed under subsection (B) hereof shall be determined by mutual agreement prior to commencement of construction or installation.

(E) It is understood that wherever used in this Section the expression "cost of the work" shall mean the cost of the work paid or payable from the funds or revenues of the parties hereto exclusive of any construction costs paid or payable from the proceeds of any grant of Federal funds made to either of the parties hereto pursuant to S. 3132, as introduced in the Senate of the United States on March 15, 1954, or other similar special legislation, to aid in the construction of the particular work whose cost is being divided between the parties hereto under the terms of this Section.

SECTION 6. The District shall establish such number of accounts, referred to in Section 4 (B), 5 (B) and 5 (C) and hereinafter in this Agreement as "Receivable" accounts, as may be necessary and appropriate, to which shall be charged all costs of restoration and replacement as provided by Section 4(B), and all construction costs as provided by Section 5 (B), and to which shall be credited all payments of such costs by the Commission and other credits authorized by Section 5 (C). A separate account shall be established for all charges made within each fiscal year with respect to each separate facility or part thereof. Not later than 30 days after a charge is made to any "Receivable" account the District shall render to the Commission a statement of such charge together with an explanation thereof. Charges made against "Receivable" accounts shall be due and payable by the Commission as provided in Section 10 hereof. Upon written notice from the Commission to the District any such charge may be paid in such number of annual installments, not exceeding ten (10), as may be specified by the Commission, but in such event the Commission

shall pay annually to the District interest on the unpaid balance of such charge at a rate equal to the average rate of interest which the District would be required to pay for loans (repayable in the same number of annual installments) obtained during such year whether funds are borrowed by the District during such year or not.

In addition to the right hereinabove granted, the Commission may, with respect to so much of any charge for cost of replacement which represents the Commission's proportionate share of such replacement cost based upon additional capacity made available to the Commission in the replaced facility but not then required for use by the Commission, and upon written notice to the District, postpone payment of any part of such charge for a period of not exceeding 10 years or until some part of such additional capacity is required for use by the Commission, whichever be the lesser period, but in such event the Commission shall pay to the District, so long as payment of said part of said charge is postponed, interest on said part of said charge at a rate equal to the average rate of interest which the District would be required to pay for loans (payable after a like period of years not exceeding ten) obtained during such years whether funds are borrowed by the District during such year or not. In addition to the rights hereinabove granted, in the event the District prior to 1970 supplements the Upper Potomac Interceptor pursuant to Section 5 hereof, the Commission may, upon written notice to the District postpone, without interest accruing thereby, payment of any part of its proportionate share of the cost of such construction until 1970 or until such earlier year in which the annual average flows entering the Upper Potomac Interceptor from Maryland exceed ten (10) million gallons per day.

SECTION 7. (A) The District agrees that with respect to every District facility, or part thereof, of which the Commission has paid all, or a part, of the cost of construction or replacement, the Commission shall be entitled to the use of so much of the capacity of such new or replacement facility, or part thereof, as does not exceed the maximum design capacity thereof upon which was based the Commission's proportionate share of such cost of construction or replacement.

(B) Except to the extent set forth in subsection (A) of this Section, the Commission recognizes that the District is primarily entitled to the entire and exclusive use of all District facilities, and that if the District at any time in order to provide for District sewage requires use of a theretofore jointly used District facility, or part thereof, to an extent which will reduce its availability to carry Maryland sewage the Commission is obligated to pay for any new construction or replacement which thereby may become necessary to meet the Commission's current or future requirements for carriage of Maryland sewage.

(C) The parties recognize that, by the terms of other sections of this Agreement, the Commission is not obligated to contribute toward the cost of any new construction unless it so elects, but that the Commission may not lawfully discharge sewage from Maryland into any District facility or part thereof except to the extent of the capacity which has been made available in such District facility or part thereof to the Commission by reason of the Commission's payment of its proportionate share of the cost of such facility or part thereof or to the extent that the District permits use by the Commission of capacity temporarily excess to the requirements of the District.

SECTION 8. (A) Until sewage flow meters shall have been installed, the total annual flow of sewage in each facility shall be either (1) estimated or agreed upon by the Engineers of the parties hereto, or (2) determined on the basis of the number of sewerage units connected to, or discharging into, such facility, or (3) based upon a combination of estimated flows and sewage units.

(B) Until changed by mutual agreement of the parties hereto, a "sewage unit" shall be considered to represent an annual flow or discharge of one hundred seventy-five thousand (175,000) gallons.

(C) For the purposes of this Agreement it is understood and agreed that each service connection to a sewer or sewerage system shall be counted as one, or more than one, "sewage unit" dependent upon the use of the premises served through such connection, as follows:

(1) For single-family dwelling purposes, each single-family dwelling unit shall constitute one sewage unit. Such single-family dwelling units may be detached or attached single-family dwellings, or may be contained in flats or apartment houses. If the dwelling unit is in a building or structure other than a detached single-family dwelling, each space in such building or structure which is occupied by, or intended for the occupancy of, a

single-family for dwelling purposes, shall constitute a separate "sewage unit" except that each apartment unit shall constitute one-half of a "sewage unit."

(2) It is further understood that units for commercial, industrial, office, institutional or business establishments of any kind, including country clubs, motels, hotels, trailer camps, restaurants, public places, night clubs, government buildings, filling stations, public schools, churches, fire houses, and municipal buildings should be determined by doubling the annual water consumption in gallons and dividing the same by the number of gallons specified in Section 8 (B).

SECTION 9. (A) The District will deduct from the total annual flow of Maryland sewage in District facilities such volume as equals the number of sewage units located in the District of Columbia which discharge into sewers or sewerage systems of the Commission which sewers or systems cannect with such District facilities.

(B) The District will credit the Commission with the number of gallons per sewage unit, specified in Section 8 (B), located in the District of Columbia which discharge into sewers or sewerage systems of the Commission without being returned to a District sewer or sewerage system.

(C) No deductions or credits will be made or allowed for sewage originating in the District, which discharges into sewers or sewerage systems of the Commission and is thereafter delivered to a District sewer or sewerage system, if the Commission does not pay flow charges to the District with respect to such sewage.

SECTION 10. The amounts equal to assessments provided for in subsection 1 (B), the cost of operation and maintenance of sewage flow meters provided for in subsection 3 (B), sewage flow charges provided for in section 4, charges against "Receivable" accounts provided for in section 6, and all other amounts and charges payable by the Commission under this Agreement shall be billed by the District to the Commission annually for the year ending June 30th, and each such billing shall show all deductions and credits as provided for in section 9. The Commission agrees to pay each such bill within thirty (30) days after receipt thereof by check drawn payable to the order of the Collector of Taxes of the District of Columbia.

It is expressly covenanted and agreed by and between the parties hereto that either party hereto may include in any subsequent bill any charge omitted from any previous bill, and that the right of each party to be paid any sum, which by any provision of this Agreement the other party has agreed to pay, shall not be barred by any statute of limitations or any other bar.

All accounts and other records maintained by either party hereto under or in connection with this Agreement shall be open for inspection by the other party or its authorized representatives at any time during regular business hours.

SECTION 11. As used in this Agreement:

(A) The word "facility" shall mean interceptor sewer, trunk sewer, lateral branch conveying sewage to an interceptor, pumping station, sewage treatment plant, any equipment used or useful in connection with any of the foregoing, or any other construtcion, structure or personal property of any description through which sewage flows or passes or which is necessarily related to the handling, pumping or treatment of sewage, but excluding movable personal property, such as trucks, tools, etc., actually used in connection with several other facilities.

(B) The phrase "lateral branch conveying sewage to an interceptor" shall mean a sewer which is not an interceptor and to which house connections are permited.

(C) The phrases "facilities which handle sewage from Maryland" and "facilities which will or may handle sewage from Maryland", as applied to District facilities, shall include not only facilities through which Maryland sewage will actually flow but also facilities which increase the availability of other facilities for the carriage of sewage from Maryland even though Maryland sewage does not flow through such facilities.

(D) "Maryland sewage" and "sewage from Maryland" shall mean sewage which has originated within the present area of the Washington Suburban Sanitary District or any extensions thereof which may be hereafter authorized by law and including territory within the state from which sewage enters into any system owned or controlled by the Commission and has entered District sewers or sewage systems through connections thereto of either (1) such Mary-

land properties under authorization from the Commission, or (2) Commission sewers or sewerage systems.

(E) "Agreement" or "mutual agreement" of the parties hereto, shall mean an agreement in writing signed by the Board of Commissioners on behalf of the District of Columbia and by the members of the Commission on behalf of the Washington Suburban Sanitary Commission.

(F) The phrases "Engineer of each party" or "Engineers of the parties", and similar phrases referring to "Engineer", shall mean the Director of Sanitary Engineering, D. C., in the case of the District, and the Chief Engineer of the Commission in the case of the Commission.

(G) All references to actions to be taken by "the parties" or by "the District" or by "the Commission" shall mean actions to be taken by the Board of Commissioners of the District of Columbia on behalf of the District and by the members of the Washington Suburban Sanitary Commission on behalf of the Commission.

SECTION 12. This Agreement may be amended or terminated at any time by mutual agreement of the parties hereto.

SECTION 13. This Agreement shall be effective as of July 1, 1954, and all prior Agreements between the parties hereto shall terminate as of said effective date.

IN WITNESS WHEREOF, the Commissioners of the District of Columbia, appointed under an Act of Congress entitled "An Act providing a permanent form of government for the District of Columbia," approved June 11, 1878, sitting as a Board, have considered and approved the foregoing Agreement, and have hereunto set their hands and caused the seal of the District of Columbia to be hereto affixed, and the Washington Suburban Sanitary Commission has caused these presents to be signed with its name by RAYMOND W. BELLAMY, Chairman, and L. S. RAY and J. NORMAN AGER, Commissioners, attested by JAMES B. PARKHILL, its Secretary, and its corporate seal to be hereunto affixed, the day and year first hereinbefore written.

COMMISSIONERS OF THE DISTRICT OF COLUMBIA,

[SEAL]
Attest:

Secretary, Board of Commissioners of the District of Columbia.

WASHINGTON SUBURBAN SANITARY COMMISSION,

By: ---

[SEAL]
Attest:

Secretary, Washington Suburban Sanitary Commission.

Representative HYDE. Then, Mr. Auld, let us dismiss just momentarily, and not without recognition of its importance, but just for the purpose of discussion the practical difficulties with respect to sovereignty, State sovereignty and State rights, and other rights.

On a functional basis, just on a pure functional administrative basis, you do find joint action not only advisable but necessary; isn't that right?

Mr. AULD. I think the need for that will increase as time goes on. And just how that can best be achieved is not clear to me. I incline, however, to the compact approach and believe that the Interstate Commission on the Potomac River Basin could, at the will of the States, be increased in scope, responsibility, and possibly authority as the States might wish, with the consent of Congress.

As I recall it, the bill you introduced last session, H. R. 599, would have made it possible under a compact provision to have even subdivisions within the compact for the approach toward local questions.

I think that has much merit.

Representative HYDE. Well, that, I think, is the general thinking when we consider the compact approach, that is not to go any further than what has been done in other jurisdictions. We are not without experience or precedent on the compact approach in this country.

Mr. AULD. No.

Representative HYDE. And it has worked very well in at least one other place, again referring back to New York.

And worked there as a matter of fact for over 20 years, and do I gather from your last remarks that you see distinct merit in the consideration of some such plan as that?

Mr. AULD. Emphatically. I have gone as far in that in relation to the Potomac Commission as suggesting for pollution that the Commission should have the authority to prescribe water-quality standards.

I have not suggested that the Commission have the authority to enforce those standards, recognizing that the State agencies have now the legal authority for that, and I believe if guidance were provided through the compact, they would readily carry through on their part, especially when the commissions on compacts wherever they are, have on them representatives of the State agencies in which the legal authority really imposes for enforcement.

Representative HYDE. Had you finished?

Mr. AULD. I am through my prepared statement.

Representative HYDE. Mr. Gutheim?

Mr. GUTHEIM. In his prepared statement Mr. Auld had referred continuously throughout to the conception of a metropolitan area-wide authority of some sort. I am mindful of the experiences in Maryland with the Washington Surburban Sanitary Commission. I wonder if you have any further comment on the desirability or feasibility or the acceptability, I might say, of some further unification of the Virginia part of the metropolitan area, since earlier testimony has indicated that it is in this area that unification is most desirable.

Mr. AULD. If you will recall, I strongly endorsed the recommendations of Dr. Wolman for the collection of sewage from upstream of the water intakes, both from Virginia and Maryland.

And as a purely engineering approach, it appears to me that from those two areas the sewage can best be conveyed to treatment by a single line downriver, which would mean some Virginia sewage would cross the river to the line itself lying in Maryland, again for engineering reasons, and being an extension of our own system, which would go from the Chain Bridge to Blue Plains.

Whether that would need—I see no need for that to have metropolitan jurisdiction or for operation for where it passes through Maryland, it could well be a part of the sanitary commission's system.

Mr. LEVIN. You mentioned throughout your statement and most of your remarks the undesirability of the superarea authority concept.

The range of consolidation that we would like to consider are greater than this one concept. Do you have any remarks to direct to the possibility which was raised in the water supply report that the Army Corps of Engineers might serve as a wholesaler for the area supplying water to the suburban sanitary district, the District of Columbia, and an integrated system in Virginia.

Mr. AULD. It is not inconceivable that some such arrangement as that could evolve, by more or less natural process.

We are partly along that way now. We have jurisdiction over that plant which they really didn't buy, let's put it that way, but they operate it, and they now supply a part of Virginia. They could extend that service if Virginia chose to have it.

I think it is a matter of engineering more than anything else. What is the best design to serve most people most cheaply.

Mr. LEVIN. You have indicated that these things will develop as a matter of course, and you have cited an example of the WSSD and the District of Columbia. This was an agreement that did develop as a matter of course piecemeal, you might say.

How long did it take for this agreement to be achieved, Mr. Auld?

Mr. AULD. You are speaking now of sewage?

Mr. LEVIN. Yes.

Mr. AULD. There have been several. The current one is several years in the making.

Mr. LEVIN. Do you think, then, that if there had been some coordinated type of approach that the time spent in negotiating for such an agreement might have been substantially reduced to allow the engineering portion of the work to begin?

Mr. AULD. I don't know how I could answer that. I don't know what the basis would be.

Mr. LEVIN. In directing your remarks to the share that the Federal Government might have in the District of Columbia and environs in the Washington metropolitan area, when we were chatting the other day, you mentioned the extra sewage or sewer capacity in terms of dilutions that are necessary in this area.

I wonder if you would give us a brief account of that?

Mr. AULD. I can't give you in dollars, but it has been proposed to us by our board, and we have accepted it departmentally, that our system of interceptors would have 5 times per dry weather, the capacity to carry 5 times the dry-weather flow.

In most of our cities which have systems like ours and most do, in fact, there are only 2 big ones that don't, Baltimore and New Orleans, those pollution ratios are smaller, usually in the order of 2 and 3.

The virtue of five and greater is that you reduce the frequency and duration of mixed overflows of sewage in storm runoff.

Were we an ordinary city, I think we would go to perhaps 3 or 4, not 5. A part of this system would have 30 to help guarantee above Key Bridge which is also good.

I think, surely, the Federal interest has been a factor in that choice.

Mr. LEVIN. To go on somewhat with the picture of sewage collection and disposal, could you make some sort of concise statement as to the operating experience of the District of Columbia in receiving and treating the sewage from the Washington Suburban and Sanitary Commission as this resulted in pollution abatement and as it resulted in lower operating and construction costs for the area as a whole.

Mr. AULD. Yes; on both counts.

To support that, I might refer to the condition of the Potomac River at Three Sisters in 1945, when the average sample, and I am guessing a little bit now, had coliform or MPN counts of five to seven thousand.

Mr. LEVIN. That is sewage bacteria?

Mr. AULD. Millimeters. Yes, sir.

In 1951, the sanitary commission connected to the upper Potomac interceptor at the District of Columbia and from that time on the sampling results were very different, and the average then dropped to about one-tenth as many.

In the Anacostia River, within 60 days after connection to our sewer in the fall of 1956, the counts dropped from an order of 2½ million organisms down to 13,000.

I think that is good evidence of improvement.

Mr. LEVIN. This certainly did not cost increased sums of money, but rather saved——

Mr. AULD. It is my opinion that the sanitary commission is enabled to dispose of its sewage more cheaply than it could by any other means which would have regional acceptance.

Representative HYDE. Excuse me.

Right at that point, it results in overall less costs per capita to all the people in the District and the people in the Washington Suburban Sanitary District.

Mr. AULD. I don't think the District of Columbia has more than a most fractional financial betterment, if any.

Mr. LEVIN. Unless you might make some estimate of the financial benefit obtained from cleaning up the river?

Mr. AULD. Oh, yes. I assume the chairman spoke of the cost of facilities.

Representative HYDE. Yes.

Well, you were, as I understood from your answer to Mr. Levin, you did say by entering into this construction on a joint cooperative basis, it was done at less cost?

Mr. AULD. Clearly to the Sanitary Commission. And I say I can't believe that there was any change in costs to the District of Columbia.

Representative HYDE. Well, wouldn't—as I understand the sharing in the costs was in the new filtration plant?

Mr. AULD. Treatment plant.

Representative HYDE. Treatment plant?

Mr. AULD. Yes.

Representative HYDE. And wouldn't the sharing of the costs over a broader segment of the population result in less costs per capita?

Mr. AULD. Yes.

Representative HYDE. Not only to the District, but to the Sanitary District?

Mr. AULD. Yes, within certain limits your costs of production and treatment are reduced in the larger units, yes.

Mr. LEVIN. You mentioned earlier that the treatment plant of the District of Columbia represented one of the large sanitary facilities in the metropolitan area.

Would it—do you believe that the District of Columbia would be willing to offer a portion of these treatment facilities for proper remuneration to the Virginia communities if some means could be evolved for bringing the sewage to the District plant and at the present time is there any capacity in the Potomac interceptor from Cabin John on down to Blue Plains for such sewage?

Mr. AULD. Your first question was plant availability.

Yes; I think the District would make any necessary expansions to fit into any beneficial metropolitan requirements; as to the other, we have at this time in our own upper Potomac interceptor a capacity of about 50 percent, which is not used at the moment, which would be available for additional flow outside the District, from outside the District.

Mr. LEVIN. Do you recall what that might be approximately in millions per gallons per day in population equivalent?

Mr. AULD. Something in the order of thirty.

Mr. LEVIN. Thirty million gallons per day?

Mr. AULD. I think so.

Mr. LEVIN. I would like to ask a few questions about the combined sewer system. In the engineering report made by the Board of Engineers to the District of Columbia, this system was analyzed, and it was shown that it would cost approximately $275 million to separate the sewers which would result in the elimination of sewage discharges into Rock Creek and a portion of the Potomac in time of storm.

In my report, I commented that it might be worth while to look at a possible modified plan for separating these sewers.

If such a modified plan could accomplish the job for, say, something in the order of $80 million to $100 million, and this money did not have to be taken from some other construction fund, do you think in terms of benefits received for money expended, that we should embark on this program of separation?

Mr. AULD. I am not sure I understand your question.

The $80 million is on top of, say, the $71 million that we would require for an adequate interceptor system?

Mr. LEVIN. No; if the $80 million to $100 million were the total figure?

Mr. AULD. It won't do it.

Mr. LEVIN. Well, the costs as analyzed showed that of the $273 million, all but about $70 million, were for separating the house and private sewers internally to divorce the sewerage from the roof leaders and downspouts.

Now, if the modified plan were adopted, which would not divorce the existing downspouts from the domestic sewerage in private dwellings and private buildings, a substantial reduction in total cost would be achieved—true, at some expense in additional size for a sanitary sewer.

But if this could accomplish the end for the price range, which I think that might be, $80 million to $100 million, would this be something to look forward to embarking upon?

Mr. AULD. I don't think any reasonable approach to this problem should be turned down.

I seriously question that the approach you suggest would succeed either to accomplish what you hoped for or could be done within the money you speak of.

Mr. Chairman, could I bring a little later to this hearing a plat which might illustrate why I am in doubt?

Representative HYDE. Yes, indeed.

Mr. AULD. Thank you.

Mr. LEVIN. Should we continue the discussion at that time?

Mr. AULD. If you like.

Representative HYDE. If we are going to continue discussion with it, Mr. Levin, I think it might be best that you bring it in tomorrow afternoon rather than this afternoon, because I doubt if we will have time.

Mr. LEVIN. To get back just for a final question on the water supply situation, what was the general experience of the District of Columbia Department of Sanitary Engineering with the Washington aqueduct in sharing responsibility as they do for the municipal water supply?

Mr. AULD. It has been outstanding. Had we been a single organization, we couldn't have done a better job, and that goes back over many, many years.

My personal association started in 1941 with the water system here, and I have never known a moment at that time when there has been any difference of opinion between our two agencies as to the validity of a project or the way in which the system should be operated.

It is perfectly coordinated.

Mr. LEVIN. Then on the one hand, you have had experience of excellent coordination between water supply agencies, the Washington aqueduct and the District of Columbia and on the other, a recent history of excellent coordination within the Washington Suburban and Sanitary District, and the District in sewage disposal.

Might this not lead to the argument that perhaps in terms of at least sub-super-authorities there might be something to be gained from coordinated efforts in this area?

Mr. AULD. Well, these two experiences have convinced me that we should stay at the lowest level possible. The lowest governmental level possible, to achieve, whatever the purpose may be. It can work.

Mr. LEVIN. Do you think this common denominator is achieved in the Virginia sector of the metropolitan area or might some further consolidation there be desirable in terms of water supply and sewage disposal?

Mr. AULD. Things are clearly unsettled in the Virginia communities. I hesitate to suggest a solution. I just don't know.

Mr. LEVIN. That is all.

Representative HYDE. Mr. Auld, to the extent that you have not already covered the subject in your testimony, could you let the committee have the answers to the questions raised in page 24 and page 25 of the two reports submitted to the committee by Mr. Levin?

Mr. AULD. Yes, Mr. Hyde.

Do you want those orally now, or in writing?

Representative HYDE. No. If you would submit those in writing. Thank you, Mr. Auld.

(The documents to be furnished by Mr. Auld follow, or are included in his later testimony.)

COMMENTS ON DOCUMENTS DISTRIBUTED BY THE JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS, GREELEY & HANSEN, ENGINEERS, CHICAGO, ILL., APRIL 17, 1958

TENTATIVE SUMMARY OF ENGINEERS' OPINION AS TO WATER, SEWAGE, AND REFUSE WORKS

(1) Assuming that is will take a few years to establish metropolitan authority, it is considered "that proposed programs for sewage treatment in the metropolitan area should be promptly supported by money appropriations" (report by Greeley, Marston & Requardt, p. XVII).

(2) Assuming that it will take a few years to establish metropolitan authority, it is suggested that the four matters stated in the letter of November 20 to the joint committee by Commissioner McLaughlin be cleared. These are as follows:

1. Federal policy about the type of community the District of Columbia should be.
2. Planning machinery.
3. Means for solving problems.
4. Organization of Congress to deal with Washington area matters.

(3) Metropolitan authority seems to be desirable with respect to some of the area problems such as the following:

(*a*) Mass transportation.
(*b*) Recreation.
(*c*) Water supply, except where local supplies are available and except as to local distribution.

(4) Metropolitan authority seems to be desirable to establish coordinated standards or objectives of water quality subject to a realistic application with reference to different reaches of the rivers and creeks and to frequencies of departure and such items as will considerably influence the cost.

(5) Local authority seems to be more likely to be applicable to sewage and to refuse collection and disposal.

(6) Of particular importance in water, sewage, and refuse works is the removal of roadblocks from methods and procedures in financing needed improvements. Financing delays have been experienced elsewhere.

(7) Mr. Auld's suggestion that an appropriation of some $500,000 be made for a competent and comprehensive study of metropolitan area problems should be supported and expedited.

(8) It is suggested that this joint congressional committee place in its library for reference a copy of the report of another joint committee entitled "Fundamental Considerations in Rates and Rate Structures for Water and Sewage Works." This is a report by a joint committee of the American Society of Civil Engineers and of the American Bar Association with six other national organizations. It states as a fundamental principle the following:

"The needed total annual revenue of a water or sewage works shall be contributed by users and nonusers (or by users and properties) for whose use, need, and benefit the facilities of the works are provided approximately in proportion to the cost of providing the use and the benefits of the works."

Methods of computing the resulting two-part rate are described in this joint report. This procedure will be of considerable assistance in arriving at estimates of fair charges for various services to users, property, and to the Federal Government.

1. General statement

There were sent to us under date of April 9 a letter from Alan Bible, chairman of the joint committee and four documents describing in several ways the problems now facing Metropolitan Washington. We consider that these documents provide an excellent basis for a discussion of the problem. Based on these documents, it is practicable to arrange the variety of problems into a preliminary order. The four documents are abstracted in the following paragraphs. It should be noted, of course, that our experience and our familiarity with the metropolitan problems is limited to water, sewage, and refuse works. Our practice in these fields has caused us to gain some familiarity with problems of financing.

PROGRESS REPORT

2. Progress report dated January 28, 1958

This report defines the Washington metropolitan region, I think, in accordance with the Bureau of the Census boundary and includes the answers of many existing organizations to the question as to what they find are the most pressing problems of the District of Columbia and its metropolitan area. These answers appear to be highly competent. A summary of the replies shows by the frequency of mention the following ranking of metropolitan problems:

Mass transportation	27
Highways	25
Recreation	21
Water supply	18
Sewage disposal	16

Stream pollution	15
Zoning and land use	14
Planning powers and organization	13
Education	8
Hospitals	5
Taxation and assessments	4
Public housing	4
Parking	2
Taxicab regulation	2
Character of National Capital area	2

Some of these problems seem to be more susceptible of regional administration than others. Some of the replies are abstracted in the following paragraphs.

3. District of Columbia

Through the President of the Board of Commissioners, Mr. Robert E. McLaughlin, the District of Columbia presented a thorough and comprehensive statement of their views regarding the metropolitan problems. In his letter to Senator Bible, the Commissioner listed the following four major problems:

1. Federal policy about the type of community the District of Columbia should be.
2. Planning machinery.
3. Means for solving problems.
4. Organization of Congress to deal with Washington area matters.

These four major problems seem to us to illustrate the difficulties of governing and administering the large metropolis under the overall jurisdiction of the Congress. An attachment to Commissioner McLaughlin's letter lists many problems of the expanding metropolitan area and includes letters from the principal agencies, authorities, and responsible departments of the District. Commissioner McLaughlin's attachment to his letter lists the following problems:

Economic, finance, and tax.
Transportation and parking.
Water supply and river pollution.
Planning.
Health and hospitals.
Welfare.
Laws and regulations.
Housing and urban renewal.
Fire fighting.
Recreation.

Letters from six individual agencies, authorities, and responsible departments are attached to this letter.

4. The Commission of Fine Arts

The letter from this Commission is different from many of the others and calls attention to the esthetic aspects of metropolitan problems. The letter is illustrated by the following topics:

(*a*) Is Washington to be developed as the Capital of the country, or as just another commercial city?
(*b*) Mass transportation.
(*c*) Government agencies should not be permitted to select sites for new buildings.
(*d*) Threats to appearance of the city of Washington.
(*e*) Development of the Mall as a cultural center for museums.
(*f*) Development of Foggy Bottom area as a site for a national auditorium and cultural center.
(*g*) Redevelopment of southwest and northwest areas.
(*h*) Failure of Government agencies, such as the Atomic Energy Commission, to consult Federal agencies, such as the Commission of Fine Arts, as to site and design of building. An Executive order could require all such agencies within the metropoiltan area to consult duly constituted Federal agencies, as Government units in the District of Columbia now are required to do.
(*i*) Failure of Government agencies to consult Federal agencies.
(*j*) Inadequate sites for buildings.
(*k*) Failure of the Federal Government to purchase land established by the plan of 1941.

The foregoing are pertinent and stimulating but do not include specifically some of the important general overall problems such as water supply and pollution abatement.

5. Northern Virginia Regional Planning Commission

This Commission, with several others, presents the views of the Virginia part of the metropolitan area. The community problems of concern to the northern Virginia communities were listed as follows:

(*a*) Inadequate water supplies.
(*b*) Expensive sewer installations.
(*c*) More adequate highways.
(*d*) Lack of park areas and open spaces.
(*e*) Better legislative and administrative tools.
(*f*) Difficulties caused by vital decisions by the Federal Government without prior consultation with local jurisdictions.
(*g*) Strengthening the installed Capital Regional Planning Council including representation by Virginia and Maryland.
(*h*) Pollution abatement.

6. Arlington County

The following items were set forth by A. T. Lundberg, county manager, which seem to us to have considerable merit.

(*a*) Public transportation.
(*b*) Private transportation.
(*c*) Water supply—supply only, not distribution.
(*d*) River pollution—criteria and standards only.
(*e*) Recreation.
(*f*) Disposition of incinerated refuse.

7. County of Fairfax

Mr. C. C. Massey submitted the following four problems:

(*a*) Transportation including bridges, expressways, mass transit, and air facilities.
(*b*) Metropolitan water supply.
(*c*) Pollution abatement.
(*d*) Parks and open spaces.

Mr. Massey states, "The responsibility for assuring an adequate and safe supply has been properly delegated to the Army engineers."

8. Comments on the progress report

One of the questions which seems to be inherent in the investigation by the Joint Committee of Washington Metropolitan Problems is that related to a municipal corporation such as a metropolitan authority to administer an area comprising the District of Columbia and adjacent parts of Maryland and Virginia. It seems to us that some of the problems are clearly of the kind that would probably be improved by regional administration. Many others seem to us to be more local than regional. Perhaps some of the problems are not altogether clear as to whether the public would gain by regional as compared to local administration. The following might be listed as susceptible of regional administration:

Mass transportation.
Recreation.
Character of National Capital area.

Water supply as distinct from distribution might properly be coordinated on a regional basis and largely developed in this way. The distribution of the water is probably better as a local operation and there are likely to be exceptions to the general administration of water supplies.

Standards of stream pollution abatement should probably be under a metropolitan authority with ample representation of local governmental bodies and with appeal by due process. The actual construction, operation, and financing of pollution abatement works seems to us to be more of a local matter, with due regard to fair compensation for expenditures caused by the Federal Government and others.

9. Financing works

It seems to us that much more attention is desirable as to fair methods of financing including a proper relation between taxation and contributions by users. To some extent this is illustrated by the financing procedures of the

Washington Suburban Sanitary Commission. This general subject and the need for overall financing, in our opinion, is inherent in the four major items presented by Commissioner McLaughlin.

STAFF REPORT ON SEWAGE DISPOSAL

10. Report by Mr. Levin on sewage disposal and water pollution

This is a good review of reports and other documents relating to sewage disposal and pollution abatement for the Potomac River. At the end is a very good bibliography. The introduction contains the following sentence:

"Some unfortunate decisions made in the past, because of expediency, immediate economy, and of course the great difficulty of foreseeing the future, have been, and in some cases still are, very costly and difficult to correct."

Much could be said regarding the application of this sentence. It seems to us that a proper balance should be developed between the degree of pollution abatement and the cost. In the absence of long-range plans of metropolitan control and methods of financing, something can be said in favor of expediency and immediate economy. Three basic questions are stated by Mr. Levin with respect to this problem:

(*a*) What are the desired degrees of stream cleanliness toward which physical works should be designed?

(*b*) What type of organizational pattern is best suited to administer the construction and operation of these works?

(*c*) What is the best means of financing the required organization, construction, and operation?

11. Effects of pollution

The following activities are listed as being the things which pollution affects:

(*a*) Recreation.

(*b*) Economic matters.

(*c*) Health.

12. Desired water uses

After a discussion and summary of the present and future estimated population, reference is made to the so-called water uses recommended by the ICPRB. These uses and the related objectives as to the characteristics of the river water are like those submitted by the ICPRB on which we have made comments. We have in mind that two matters should be put into the record with regard to uses and objectives as follows:

(*a*) The degree of pollution abatement should be related to the several stretches or reaches of the Potomac and Anacostia Rivers and other tributary streams.

(*b*) The degree and cost of pollution abatement should be considered with regard to frequency of departure from reasonable standards, and overall economy.

In this connection, the design population of the District of Columbia sewage treatment plant is stated to be 1,790,000 which I think is from the report of the Board (Greeley, Marston, & Requardt). It is also stated that approximately 2 percent of the sewage of the District of Columbia escapes to the rivers prior to reaching the treatment plant. This general statement needs checking and study with reference to the seasons of the year, points of overflow, the proposed corrective works, and the like.

13. Multiple systems

It is stated on page 15 that the decision in 1954 by the northern Virginia communities to construct so-called multiple sewage systems and treatment plants was unfortunate. It is not likely, in our opinion, that it will be found to be sound economically, practically, and necessarily efficient as regards pollution abatement. Figure 4 in the Levin report from the 1954 northern Virginia report is said to need reexamination.

14. Silt

The report suggests that further studies and efforts should be made to provide effective means of controlling silt. Wastage of topsoil and the resulting silt should be reduced.

15. Sewage capacity of Potomac

This matter is referred to in terms of the population equivalent of the raw sewage (or effluent) which the Potomac River has capacity to assimilate. It is stated that the future may bring lower assimilating capacities than what is suggested as a present number of 500,000.

16. Separation of combined sewers

The discussion of this problem in the Levin report concludes that there should be reconsideration of the recommendation in the report of the Board of Engineers against complete separation of combined sewers.

17. Financing

A good statement relative to limitations imposed by what might be termed "unresponsive financing" is summed up in the following pertinent paragraph:

"Unless an equitable and satisfactory means of financing is established throughout the metropolitan area, it will be unrealistic to expect anything other than tortuous and piecemetal progress in pollution abatement."

18. Summary and conclusion

The foregoing abstracts omit some parts of the report. There is at the end a very good summary of the major problems now requiring attention. There are 10 of these to which reference should be made, but they are not inserted in this statement. Item No. 10 asks, "What is the best means for financing?" It is suggested that a wording like "Best organization and method of financing, etc." would be somewhat more comprehensive. In the concluding statement, it is warned that the analysis presented in the report is only a presentation of the difficult problems confronting the metropolitan area.

STAFF REPORT ON WATER SUPPLY

19. Report by Mr. Levin on water supply

As stated at the end of this report, it is the opinion of Mr. Levin that water-supply and sewage-disposal problems are part of a single concept. Reference is made to the information and discussions in the so-called companion paper, Sewage Disposal and Water Pollution. This should be noted in connection with the extent of the water supply report. The scope of the report is indicated by the following list of its center headings:

(*a*) Types of use.
(*b*) Quantities needed.
(*c*) Pollution requirements.
(*d*) Irrigation.
(*e*) Existing planning.
(*f*) Principal water supply problems.
(*g*) Integration of water systems.
(*h*) Threat of pollution.
(*i*) Industrial wastes.
(*j*) Financing.

In the discussions of some of the foregoing topics, the text of the report is applied to Maryland, Virginia, and the District of Columbia. The following pertinent statement is made:

"As is the case with sewage disposal and water pollution problems, lack of adequate financing is an important factor in the water supply problems of the Washington metropolitan area."

20. Summary and conclusion

The summary of the major problems requiring attention is useful and comprehensive and is quoted as follows:

1. How shall an adequate source of water supply be provided for the present and future needs of the area? This question primarily resolves itself to "What type of storage facilities should be provided on the Potomac River?"

2. Should the water supply systems in the Washington metropolitan area be consolidated either administratively or physically, or both?

3. What steps can be taken to assure that future decisions affecting water supply be made in a spirit of cooperative area planning rather than community competition?

4. How can the Potomac River upstream from Washington be protected against future pollution from residential, commercial, and industrial development?

5. For what period into the future should plans and construction be undertaken?

6. What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

The report states, "the problems of water supply are very closely related to the major problems described in the companion paper, Sewage Disposal and Water Pollution. Water supply and sewage problems are really part of a single concept—proper water use. For this reason, the Washington metropolitan area would do well to solve both sets of problems by means of unified or closely related planning, construction, and operation."

STAFF REPORT ON CONSERVATION AND RECREATION

21. Report by Mr. Frank on conservation and recreation

The subject of this report is important to the general public. Mr. Frank had the cooperation of the following services and departments:

Forest.
Soil Conservation.
Fish and Wildlife.
Game and Inland Fish.
Interstate Commission on the Potomac River Basin.

22. Status and achievements

The present status of conservation and recreation is described with an outline map of the drainage area of the Potomac River. There is good reference to the achievements in this field.

23. Elements of a comprehensive program

Minimum objectives of a sound program are summarized as follows:

(*a*) Effective measures to minimize erosion.
(*b*) Improved stream flow distribution by vegetative and minor mechanical methods, especially in the upper reaches.
(*c*) Increasing yields of land having productive soil.
(*d*) Improvement in park and recerational lands and facilities.
(*e*) Building a sounder knowledge of conservation and recerational problems.
(*f*) Developing a more intelligent public understanding.

24. Achieving coordinated action

Under this heading there is reviewed the activities of a number of existing boards, committees, and commissions. With special reference to Rock Creek, but in our opinion, having more general application, the following objectives are stated:

(*a*) Control of erosion, storm runoff, and flooding.
(*b*) More effective control of pollution by sewage, silt, and trash.
(*c*) More adequate park and other recreational areas.
(*d*) Development of a comprehensive cooperative improvement program.

25. Early action needed

It is well stated that to accomplish desirable conservation and recreation facilities, early action is needed because opportunities are removed as population increases and spreads.

As suggested above, each of the foregoing four documents includes very complete bibliographies.

STATEMENT OF ELLIS S. TISDALE, DIRECTOR, INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

Representative HYDE. Our next witness is Mr. Tisdale.

Mr. Tisdale, the committee is mighty glad to have you. For the sake of the record, would you give your full name and your affiliation.

Mr. TISDALE. Mr. Chairman, I appreciate very much the opportunity to be with you here this afternoon.

My name is Ellis S. Tisdale. At the present time, I am the Director of the Interstate Commission on the Potomac River Basin.

The Interstate Commission on the Potomac River Basin, which has authorized me as its Director, to make a brief statement today, has been intensively at work for several years on programs dealing with safeguarding the public water supply of Washington, D. C., and controlling detrimental water pollution of the Washington metropolitan area.

I feel that Congressman Hyde has done a great service by bringing into being this effort to bring everybody's attention directly on to these pressing matters, and I think that this committee can be a very great help in resolving the conflicts which have been evident for the past decade, and which are preventing progress.

Now, the Commission is about 18 years old. One of its latest acts on January 22, 1958, was when it accepted and approved the attached report of its Water Committee. This report sets forth five zones on the Potomac River from the mouth of the Monocacy River, which is upstream from Washington, D. C., to the mouth of the Occoquan River, which is downstream.

The excellent report by your consultant, Gilbert Levin, mentions these five zones and very briefly comments on them.

I should like to file with you today the complete report of that Water Committee which was accepted and approved by the Commission at its meeting in Richmond, Va., on January 22, this year, and authorized the Director to forward to Colonel Welling, who was Chairman of the Subcommittee on Water Supply and Pollution Abatement, and who told of the very fine constructive efforts of that Committee during the past several months by getting together and bringing about understandings so that they could move ahead in setting up and recognizing the priorities of the different water needs in this area and trying to bring about an approval of the criteria on water quality.

Now, the Commission authorized me, as its Director, to forward to the various State agencies, the control agencies, copies of these recommendations, and request information from them as to whether their standards for the control of sewage, waste effluent at present, as they were carrying them out in their own States were adequate to maintain these criteria in the Washington metropolitan area.

A word about the Commission's interests in a safe and adequate water supply.

In order to keep contaminating effluents out of the Potomac River about the District of Columbia water-supply intakes, it is apparent that sewage-collection systems in the outlying upstream areas should be physically integrated so that treatment and discharge of effluents can be made downstream from the Washington metropolitan area.

Mr. Auld just spoke of the achievement of integration of the suburban area in Maryland, Montgomery County, Prince Georges County, Washington Suburban Sanitary Commission, and what has been brought about through 40 years of careful planning and discussion in bringing waste together and getting them down below the city for treatment.

Some such effort is evidently needed on the other side of the river in order to achieve such an objective.

With the rapid population growth of the Washington metropolitan area, it has become apparent that the natural flow of the Potomac

River will soon be inadequate to meet the future water-supply requirements.

Mr. Levin's report, I think, brings that out very clearly, and makes a plea for long-range statesmanlike dealing with this question now.

The United States Army Corps of Engineers should be urged to expedite its Potomac Basin studies so that alternate plans for water storage will be available for consideration in advance of critical need. Appropriations for the Potomac Basin studies, as brought out this morning and endorsed by Colonel Welling, should be increased to enable participating Federal agencies to cooperate with the corps to the fullest extent so that the Potomac studies will include the aspects of water and watershed planning, and be truly comprehensive in scope.

Now a word about the necessity for Federal aid in planning and financing water and sewerage works.

Since Washington is the seat of the Federal Government, and Capital City of the Nation, the Federal degree of financial responsibility for the needed water supply, and pollution control works should be carefully reevaluted.

The committee should study, in my opinion, the waste disposal problems attending the location of Federal agencies in outlying areas, to see if planning requirements should include facilities of adequate size to provide down-river sewerage systems both for the Federal installations themselves, and also, for the anticipated growth of satellite communities.

Without such advance planning, progress in pollution control in the outlying areas is apt to be piecemeal and will result in continuous threats to the water supply and to public health.

(The report referred to is as follows:)

REPORT AND RECOMMENDATIONS OF WATER COMMITTEE

Interstate Commission on the Potomac River Basin

INTRODUCTION

The members of the Water Committee, Interstate Commission on the Potomac River Basin, and others, met in the office of the Commission, January 9, 1958, to develop water quality objectives for the Potomac River in the Washington metropolitan area. Present were:

David V. Auld: Director, Sanitary Engineering, District of Columbia.
William H. Cary, Jr.: Chief, Bureau of Food and Public Health Engineering, District of Columbia.
John V. Brink: Public Health Engineer, Department of Public Health, District of Columbia.
Roy Orndorff: Deputy Director, Sanitary Engineering, District of Columbia.
Henry Schilpp: Sanitary Engineer, Maryland State Department of Health.
John Geyer: Professor of sanitary engineering, the Johns Hopkins University.
E. C. Meredith: Chief engineer, Virginia State Department of Health.
John C. Smith: Chief Water Supply Division, Washington District Corps of Engineers.
John Krasauskas: Chief, Plant Operations Branch, Water Supply Division, Washington District Corps of Engineers.
Edwin A. Schmitt: Consultant.
Ralph Fuhrman: Secretary, Federation of Sewage and Industrial Wastes Associations.
Byron Bird: Chief, Engineering Division, Washington District Corps of Engineers.
L. F. Warrick: Technical services consultant water supply and water pollution control program, USPHS.

Ellis S. Tisdale: Director, Interstate Commission on the Potomac River Basin.
Donald S. Wallace: District Engineer, United States Geological Survey, Charlottesville, Va.

The Washington Metropolitan Regional Conference, through the chairman of its water supply and pollution abatement committee, Col. A. C. Welling, Engineer-Commissioner, District of Columbia, had requested through a letter that the Commission review the water-quality objectives contained in the printed 1954 report on water pollution in the Washington metropolitan area. It was asked to give the metropolitan conference recommendations as to suitable river-water objectives and criteria in the light of recent developments in the Washington metropolitan area from the mouth of the Monocacy to the mouth of the Occoquan Rivers.

The following report is the result of the deliberations of the water committee on January 9, 1958, meeting with representation from the State and other organizations concerned with regulatory measures on water-pollution control.

The ultimate goal of a comprehensive pollution-abatement program is to provide that quality of water in the Potomac which will be compatible with the principal uses the people desire to make of them. Many uses are currently being made of the river, even though the water quality is far from desirable for many such uses. Other uses are proposed for the future which can be realized only if pollution abatement is achieved. It is believed that the following water-quality objectives and criteria for five sections of the Potomac River in the Washington metropolitan area are capable of achievement and desirable of attainment. Some aspects are admittedly long-range objectives. For example, the complete removal of raw sewage must await the elimination of combined sewage and an application of practical methods of disposal of sewage and other wastes from boats. Nevertheless, the objectives are worthy goals and should be sought.

Because of the varying nature of the streams and the situations pertaining to them, no single set of water-quality criteria can be made to apply to the entire metropolitan region. The portion of the Potomac under consideration has been divided into five sections:

(1) Mouth of Monocacy to Great Falls.
(2) Great Falls to Little Falls.
(3) Little Falls to Key Bridge.
(4) Key Bridge to Fort Washington.
(5) Fort Washington Hallowing Point.

Key Bridge is the present division point between sections (3) and (4), but this would be moved downstream to the vicinity of 14th Street Bridge in Washington at the proposed barrier dam, if the provision for a water recreation basin is adopted as recommended in the Wolman report entitled, "A Clean Potomac River in the Washington Metropolitan Area," November 1957.

As a basic consideration applying to all sections, the Commission advocated that all sewage or industrial wastes discharged or permitted to flow into tributaries of the Potomac should be treated to that extent, if any, which may be necessary to maintain such waters in a sanitary and satisfactory condition at least equal to the criteria recommended below for the waters of the Potomac immediately above the confluence of the tributary with the main stream.

The water-quality objectives for the sections indicated above are as follows:

SECTION 1. POTOMAC RIVER: MONOCACY RIVER TO GREAT FALLS

Objective: The establishment of conditions suitable for domestic water supplies, fish propagation, and recreational uses, and elimination of excessive soil erosion.

Criteria: The water quality shall be held in the normal natural condition of the stream, with nearly all samples falling within the following limits:

1. Coliform group: MPN not to exceed 2,000 per 100 milliliters.
2. Hydrogen-ion concentration: Range between 6.5 and 8.5.
3. D. O.: Monthly median not less than 6.5 parts per million, with no D. O. below 4 parts per million.
4. Turbidity: After opportunity for good mixing in the river, turbidity of the stream should not be appreciably changed.
5. Other conditions: There shall be not floating solids, oil, settable solids, or sludge deposits attributable to sewage, industrial wastes, or other wastes. There shall be no toxic wastes, deleterious substances, colored or other wastes,

or heated liquids, taste-or-odor producing substances, either alone or in combinations sufficient to be injurious to fish life or to make the waters unsafe or unsuitable as a source of municipal water supply or other desirable uses.

SECTION II. POTOMAC RIVER: GREAT FALLS TO LITTLE FALLS

Objective: The elimination of sewage and waste effluent and excessive soil erosion so that the water will be suitable for domestic water supplies and fish life.

Criteria: The water quality shall be held in the normal, natural condition of the stream, with nearly all samples falling within the following limits:

1. Coliform group: MPN not to exceed 2,000 per 100 milliliters.
2. Hydrogen-ion concentration: Range between 6.5 and 8.5.
3. D. O.: Monthly median not less than 6.5 parts per million with no D. O. below 4 parts per million.
4. Turbidity: After opportunity for good mixing in the river, turbidity of the stream should not be appreciably changed.
5. Other conditions: There shall be not floating solids, oil, settleable solids, or sludge deposits attributable to sewage, industrial wastes, or other wastes. There shall be no toxic wastes, deleterious substances, colored or other wastes or heated liquids, taste-or-odor producing substances, either alone or in combinations in sufficient amounts to be injurious to fish life or to make the waters unsafe or unsuitable as a source of municipal water supply or other desirable uses.

SECTION III. POTOMAC RIVER: LITTLE FALLS TO KEY BRIDGE

Objective: The elimination of sewage and waste effluent and excessive soil erosion so that the water will be suitable for swimming, boating, shore recreation, and safe for all species of fish life with favorable conditions prevailing for their propagation.

Criteria: The water quality shall be held in the normal, natural condition of the stream, with nearly all samples falling within the following limits:

1. Coliform group: MPN not to exceed 2,000 per 100 milliliters.
2. pH: Range between 6.5 and 8.5.
3. D. O.: Monthly median not less than 6.5 parts per million with no D. O. below 4.0 parts per million.
4. Turbidity: After opportunity for good mixing in the river, turbidity of the stream should not be appreciably changed.
5. Other conditions: There shall be no floating solids, oil, settleable solids, or sludge deposits attributable to sewage, industrial wastes or other wastes. There shall be no toxic wastes, deleterious substances, colored or other wastes or heated liquids, taste-or-odor-producing substances, either alone or in combinations, in sufficient amounts to be injurious to fish life or to make the waters unsafe for swimming or shore recreation.

SECTION IV. POTOMAC RIVER: KEY BRIDGE TO FORT WASHINGTON

Objectives: To reduce the quantity of combined sewage discharged, and to control the quality of wastes effluents by effective treatment so as to make the water suitable for boating, shore recreation, industrial water supply and safe for the passage of all species of fish, with favorable conditions prevailing for the propagation of the hardier types.

Criteria: The water quality shall be maintained so that the results of most of the samples fall within the following limits:

1. Coliform group: MPN not to exceed 10,000 per 100 milliliters.
2. pH: Range between 6.5 and 8.5.
3. D. O.: Monthly average not less than 5.0 parts per million with no D. O. below 4.0 parts per million.
4. Turbidity: After opportunity for good mixing in the river, turbidity of the stream should not be appreciably changed.
5. Other conditions: There shall be no floating solids, oil, settleable solids, or sludge deposits attributable to sewage, industrial wastes, or other wastes. There shall be no toxic wastes, deleterious substances, colored or other wastes, or heated liquids, tastes-or-odor-producing substances, either alone or in combinations, in sufficient amounts to make the waters unsafe or unsuitable as a source of industrial process water supply, or for boating, shore recreation, passage of all species of fish or propagation of the hardier species of fish.

SECTION V. POTOMAC RIVER: FORT WASHINGTON TO HALLOWING POINT

Objective: To reduce the quantity of combined sewage discharged and to control the quality of waste effluents by effective treatment of wastes and disinfection by effluents to make the water suitable for boating, fishing, swimming, and other recreational uses.

Criteria: The water quality shall be maintained so that the results of most of the samples fall within the following limits:

1. Coliform group: MPN not to exceed 2,000 per 100 milliliters.
2. pH: Range between 6.5 and 8.5.
3. D. O.: Monthly average not less than 6.5 parts per million with no D. O. below 4.0 parts per million.
4. Turbidity: After opportunity for good mixing in the river, turbidity of the stream should not be appreciably changed.
5. Other conditions: There shall be no floating solids, oil, settleable solids, or sludge deposits attributable to sewage, industrial wastes or other wastes. There shall be no toxic wastes, deleterious substances, colored or other wastes, or heated liquids, tastes-or-odor-producing substances, either alone or in combinations, in sufficient amounts to be injurious to fish life or to make the waters unsafe or unsuitable for swimming, fishing, or other recreational uses.

INTERPRETIVE NOTES

In arriving at numerical values included in the foregoing objectives, it is the intent that APHA standard methods be utilized. It is further intended with a series of samples, that arithmetical averages be used.

The reference "Other wastes" under condition No. 5 of the foregoing objectives shall be interpreted to include trash, garbage, dirt, soil, or any matter causing or aiding pollution.

With reference to disinfection of effluents for safeguarding of recreational areas, it is intended that the recreational season comprise the period May 1 to September 30.

It was brought out at the meeting of the committee that Virginia has existing authority for local governing bodies to control pollution within 5 miles of a waterworks' intake.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the Water Committee recommends the adoption by the Interstate Commission on the Potomac River Basin of the water quality objectives as set forth in this report.

David Auld, William Cary, John Brink, Roy Orndorff, Henry Schlip, E. C. Meredith, J. C. Smith, John Krasauskas, Edward Schmitt, Ralph Fuhrman, Byron Bird, Donald Wallace, A. H. Paessler, Paul McKee, Karl Mason, John Geyer, L. F. Warrick, *Chairman, Water Committee.*

JANUARY 9, 1958.

Mr. TISDALE. I believe that there possibly is some hope in the amendments to the Blatnik bill, which has been introduced into the Congress. This might be looked at, at least.

They say there is an element in the amendments there which take some consideration of that important matter, because all the metropolitant areas face that same dilemma.

I should like to comment just very briefly upon this water report which I am submitting with this statement today, to call to your attention the type of people of the 15 or more people that participated in developing this report. They are outstanding leaders in their profession, from the District of Columbia, from Maryland, from Virginia, from the Corps of Engineers, and from the Public Health Service.

They have representation of the basin statements that are interested in this matter. So that it should form a basis for really getting some action on the water criteria, water quality criteria.

What evidences of interest has the Commission shown in these problems which are before you today. Let me just briefly list them. In 1954 the Commission made an extensive report on the metropolitan pollution situation, and in that report, the criteria for water quality were set forth. That report was made with the cooperation, not only of Federal agencies, the staff of the Commission, but all of the representatives from the jurisdiction in the metropolitan area, and it served as a basis for a very extensive educational campaign assisted by the press and by radio and television, so that the people would come to understand what these problems were in the metropolitan area.

Representative HYDE. Excuse me, what was the date of that report?

Mr. TISDALE. February 1954. Then in 1955, the Commission felt that they should take some leadership in this matter and they developed a comprehensive report on a legislative and administrative approach to obtaining clean water in the Potomac River in this area, which report was approved on November 7, 1955, and transmitted to the Members of the Congress and the interested agencies.

No congressional legislation was passed, following out the recommendations of this report, but the Commission was able in 1956 to retain a consultant to develop a long-range pollution control plan for the metropolitan area, and the Commission has filed with this committee, Mr. Wolman's report which carries recommendations for pollution control for the metropolitan area to the year 2000.

I think it is interesting to note one of Mr. Wolman's recommendations in the report is to the effect that the local progress, some integration is needed as Mr. Auld just pointed out a few moments ago, to bring these several jurisdictions into an interceptor and get the waste down before the water supply intakes, but the several jurisdictions in Maryland, in the District of Columbia, and in Virginia are doing an excellent job in working out their plans and their programs. Specifically, I refer to Alexandria, Arlington, Fairfax County, the District of Columbia, and the Washington Suburban and Sanitary Commission.

The Commission has further done this: They felt that they might be of more service and help to the citizens of this basin and the citizens in Washington and the many millions of visitors, and so they have studied their compact. They have come out with a recommendation for a revision of that compact, and that compact revision report was adopted by the Commission at a recent meeting.

It provided for retaining consultants to advise them, eminent consultants who have an understanding of what we can do by compacts and how we can work out these regional programs, and how we can best reach down and bring contact with the States and the local people so that we can get folks to work together, and the Commission has now authorized and engaged a consultant to bring to them by next September a long-rang plan for more fully and more effectively serving the people of the basin in all aspects of water conservation, if that is what should be done.

In closing, may I say that the Commission has done the best it could to bring forcibly to the public this matter of pollution control in the metropolitan area. It has built its last two programs, winter programs of 1956 and 1957, around the theme of what are we going to do to control pollution in the Washington metropolitan area, and it

pointed out that we are doing something—that in the last decade these 5 jurisdictions, that I speak of, have spent $58 million, to control pollution, so I think we are making some progress.

I think we should make note of that. Despite the fact that we have this great mass of problems facing us, I think we should give consideration to the progress we have made through the good efforts of these several jurisdictions.

May I say in closing, that the Commission, I feel, will be glad to file with this committee the report of its consultant relative to the ways in which it is felt a compact might be amended, provided, of course, the States can understand that it is desirable to amend the compact and the Federal Congress will approve that action.

Representative HYDE. That report will be received at this point. Are you submitting it for the record at this point?

Mr. TISDALE. No, it won't be ready until September 1958. I don't have it ready yet. We are just starting to work on it, but we hope to have it ready by September of this year.

That, briefly, possibly senses some of my own feelings in this respect. I am not authorized, you understand, to speak on policy matters for the Commission, but only to tell you the actions which they have taken and of the interest, the genuine interest, they have in helping to solve these problems of water supply and waste disposal.

Representative HYDE. Thank you, Doctor Tisdale. The committee appreciates very much your taking the time to come up here and give us the benefits of your point of view.

Just 1 or 2 comments: I appreciate your desire to give credit where credit is due so far as progress is concerned, and I think we can recognize the efforts that have been made.

But isn't it true that we, nevertheless, have a more polluted river at the present time than we have ever had before?

Mr. TISDALE. It is about this situation, that we have to run just about as fast as we can in order to stand still, because our population is growing so fast.

We have got to keep progressing pretty rapidly in order to hold the ground and keep it reasonably good.

I anticipate when the new plant at Blue Plains gets into operation this year, that you will see a very marked improvement in the Potomac River, and the metropolitan area just as you have noticed a marked improvement in the Anacostia River when the sewage was taken out of it and put into a conduit and transmitted and carried, transported to Blue Plains.

A big improvement is going to take place this year. That shouldn't make us willing to sit back and say the job is done.

Representative HYDE. I take it from what you said about the study that is now being made, the report which will not be ready until September, that your Commission would not feel in position to answer most of these questions raised in Mr. Levin's two reports until that study is completed, is that correct?

Mr. TISDALE. Mr. Hyde, I believe at the next Commission meeting, they would be very glad to give consideration to those matters. They will be meeting in May, and we can get those matters before them, and get action, whatever your committee desires.

Representative HYDE. Will you then at that time take up this matter of the answers to the questions raised in the report?

Mr. TISDALE. In both the water supply report and the pollution?

Representative HYDE. Yes, both the sewage disposal and water pollution report and the water supply report.

Mr. TISDALE. Be glad to.

Representative HYDE. The committee would appreciate having the benefit to the Commission's views on those questions raised there.

Mr. Gutheim, any questions?

Mr. GUTHEIM. Just a few short ones.

Mr. Tisdale, you referred to the standards which the Commission has established for various stretches of the river, and you have made this part of the record, I believe. Is that correct?

Mr. TISDALE. Yes. It is contained in the material which was transmitted to you.

Mr. GUTHEIM. I only wanted to make sure that the reporter had this.

The second question is, in referring to the study which has now been authorized and which you say has commenced, which will be reported in September, I am sure you know we want to work very closely with the Commission and its staff in maintaining the closest degree of coordination with the development of that study.

Can you tell us who the consultant is?

Mr. TISDALE. Abel Wolman.

Mr. GUTHEIM. Who will be working on it? Of course we will be in touch with Mr. Wolman.

One final question, are you familiar with the report that was prepared by Bernard Frank entitled "Metropolitan Water Problems"?

Mr. TISDALE. Yes, I have read it.

Mr. GUTHEIM. You recall Mr. Frank offered three possible alternative ways of getting on with the job of considering the Potomac Basin as a whole, one of which was the establishment of a Federal Board of Review and Coordination, the second of which was for a Federal-State Agency Basin Committee, and the third of which was the extension of the responsibilities of the Interstate Commission on the Potomac River Basin.

It is the latter part that I wanted to consider, and specifically the conception that is embodied in the suggestion that a broad and rather continuing study, a rather more ambitious and extensive study than anything which the Commission has previously undertaken should be a desirable role for the Commission to assume.

Do you have some comment on this particular suggestion?

Mr. TISDALE. I agree with that concept, sir.

Mr. GUTHEIM. We heard this morning from Colonel Welling about the Potomac Basin survey which has been commenced and for which additional funds are now being sought in the Congress. Have you any observation to make on that survey or that type of survey, for example, as contrasted to the rather broad multipurpose inquiry that Mr. Frank has described?

Mr. TISDALE. I think all of the matters that bear on water conservation and, of course, including recreation and conservation should be taken into consideration, and as I understand it, that is now being done by the corps to the best of their ability by cooperative working agreements with many other Federal agencies and obtaining their services so that these data may be made available.

Mr. GUTHEIM. I think Colonel Sumner will testify later this afternoon, and will be able to describe the details of their work.

I thought possibly you would be able to give us your own interpretation of what the Interstate Commission might be able to contribute to what I might call our better understanding of the Potomac and its problems that might go beyond what they had proposed.

Mr. TISDALE. I might simply say this, that one thing which the Commission has undertaken has been through the leadership of Mr. Frank as chairman of our recreation committee has been a study of the recreational assets of the basin, and whether or not these recreational assets will be adequate to serve the basin in the year 2000.

That report has been carried out by Carl Johnson, my associate for the last several months, and is now being printed and will be made available to the corps.

The key point, I think, is that we have got to seek an instrument for reflecting accurately the feelings of the local people, and measuring and understanding the State attitudes with respect to all of these things that bear on water conservation, to establish a continuing relationship with them; not a survey carried out once in 19 years, but a continuing relationship so that they understand at that level what is being sought, and thereby cooperating with it, and assisting in bringing it to fulfillment. That is the sort of a thing which possibly our Commission might be helpful in doing. I am not certain. I certainly see the flaws in an interagency approach of accumulating a vast shelf full of data and then having no way to have that motivated, you see.

You can't motivate the State and local people by a Federal edict. You have got to have——

Mr. GUTHEIM. The three points that I would summarize from your statement, Mr. Tisdale, and I am repeating this to make sure I have got it correctly, are first, the superior qualifications of the Commission as a grassroots type of agency, its greater representative character. Second, the fact that many of the Potomac problems are outside of what could be described as the Federal interest, the scope of Federal programs, and so forth. And finally, the difference between a continuing study rather than one with definite beginning, middle, and end and winding up a completed entity.

Is that correct?

Mr. TISDALE. I think that is correct.

Mr. GUTHEIM. Thank you.

Representative HYDE. Mr. Levin?

Mr. LEVIN. I have no questions.

Representative HYDE. Doctor, carrying out the thought last expressed by you, an interstate agency established by an agreement between the local jurisdictions, members to which are appointed by the local jurisdictions, and the rules and regulations of which are thereby put into effect by the representatives of local jurisdictions, would seem to be the proper type of an organization for a continuing planning and studying, and even perhaps regulating; would it not?

Mr. TISDALE. You say the jurisdiction, you mean the States?

Representative HYDE. Yes; the States and the local jurisdictions, too, counties, cities, and what have you, for a river basin region.

Mr. TISDALE. Yes; I think that you have got to have that representation in order to get down to the grassroots to get the job done.

Representative HYDE. And going one step further, I think it goes without saying that your commission certainly has not had adequate funds in the past to do the planning that the problem called for.

That is true, or is it not?

Mr. TISDALE. Our Commission is very happy, Representative Hyde, to have had a Federal grant for the past year from the new Federal water pollution law which has enabled us to do many things we have never been able to do before. We have doubled our budget from Federal grants under the Blatnik law, and many other States have had the same building up of their staff, not excessive, but getting the essential people they need to do the work, and we are very happy about that. We hope——

Representative HYDE. I am speaking of before that time.

Mr. TISDALE. Before, yes, sir. We were exceedingly poor. We are poor yet. But I mean we are in a little better shape.

Representative HYDE. Do you not feel that with respect to this need for Federal funds, such as you referred to at the bottom of page 2 in your statement, that as a practical matter, there will be—it will be easier to get Federal funds for these very important projects on a regional basis, rather than a local basis.

Mr. TISDALE. I think so.

Representative HYDE. Thank you, Dr. Tisdale.

Mr. TISDALE. Thank you.

EXHIBIT A.—*Federal program grant payments to States involved in the Washington metropolitan area, the District of Columbia, and the Interstate Commission on the Potomac River Basin*

	1950	1951	1952	1957	1st 3 quarters of 1958
District of Columbia	$10,304	$9,800	$6,373	$10,075	$8,000
Maryland	13,216	12,800	12,500	33,907	37,500
Virginia	17,774	17,300	17,400	38,738	45,680
Interstate Commission on the Potomac River Basin	(1)	(1)	(1)	17,544	21,371

[1] No information.

EXHIBIT B.—*Projects under Public Law 660 in metropolitan Washington area*

Location	Project No.	Eligible cost	Grant
District of Columbia:			
Washington	WPC-DC-1	$5,904,928	$330,000
Do	WPC-DC-2	375,000	112,500
Total		6,279,928	282,500
Maryland:			
Cabin John Creek	WPC-MD-1	1,000,480	250,000
Cabin John Park	WPC-MD-11	129,700	35,282
Sligo Creek	WPC-MD-16	137,930	27,486
Laurel	WPC-MD-4	1,264,326	250,000
Rockville	WPC-MD-18	18,690	3,738
Gaithersburg	WPC-MD-17	997,300	148,000
Total		3,548,426	714,007
Virginia:			
Arlington	WPC VA-5	298,246	77,071
Herndon	WPC-VA-26	137,851	11,664
Fairfax	WPC-VA-16	897,819	77,071
Dogue Creek	WPC-VA-17	379,200	38,208
Occoquan-Woodbridge	WPC-VA-35	164,800	26,700
Holmes Run	WPC-VA-18	395,531	66,347
Little Hunting Creek	WPC-VA-20	222,204	36,350
Total		2,495,651	333,331
Grand total		12,324,005	1,410,088

Representative HYDE. Our next witness is Colonel Sumner.

STATEMENT OF COL. GEORGE P. SUMNER, DISTRICT ENGINEER, UNITED STATES ARMY ENGINEER DISTRICT, WASHINGTON, D. C.

Colonel SUMNER. I am Col. George P. Sumner, district engineer, United States Army Engineer District, Washington, D. C. I have no statement, Mr. Chairman. I will be glad to make one if you wish, or to answer questions.

Representative HYDE. One thing I would like to have you put into the record, Colonel, just a brief statement as to the scope of the survey. I know this has been said before, before committees of Congress, but for our purposes we would like to have it in our record.

Colonel SUMNER. The District for the Corps of Engineers is presently engaged in a survey of the Potomac River Basin, comprehensive as to water and related resources.

The survey will cover water requirements, flood control, pollution abatement, recreational needs.

In the course of making the survey, we will have the cooperation of other Federal agencies in their particular fields, including the Bureau of the Census, the Department of Commerce, the Bureau of Economics which will give us population and industry studies, the Soil Conservation Service of the Department of Agriculture, and the Department of Forestry of the United States Forest Service, the United States Fish and Wildlife Service, the United States Public Health Service, the National Park Service, the United States Geological Survey, and there are some other agencies which will participate to a lesser degree.

The findings of all these agencies will be considered and all be made a comprehensive part of the study of the basin.

We will be and are at the present time engaged in projecting water requirements, and have held and will hold additional public hearings to determine the needs of the various sections of the basin.

At a later date, when our study has progressed sufficiently far to make a determination of the requirements and possible plans for the solution, additional public hearings will be held to discuss those possible plans with the people who will be affected by them or who might be.

Mr. Chairman, is that sufficient?

Representative HYDE. Thank you, Colonel.

I understand that the original request for this session was $200,000; is that right?

Colonel SUMNER. That is the——

Representative HYDE. Was that the original amount arrived at by the Bureau of the Budget?

Colonel SUMNER. That is the official request, yes, sir.

Representative HYDE. That is the official request.

I also understand that it is desirable to have a $500,000 request. What difference will that make in your timetable if you increase that budget from $200,000 to $500,000?

Colonel SUMNER. That is difficult to answer because we do have a timetable of 1961, and if we are limited to the $200,000 this year and get a lot more money, say, next year, presumably there could be a piling up of the work in that period, and——

Representative HYDE. Piling up of the work—excuse me—in what period?

Colonel SUMNER. In a later period. If the additional money came—this is fiscal 1959 we are talking about—if it came in fiscal 1960, of course there would be just that much more work that would have to be done in that period of time, and whether or not the other agencies—most of this money would go to the other agencies, by the way, if this additional money that you speak of were granted—whether they would be able to accomplish the work in time to enable us to proceed in an orderly manner is doubtful.

Representative HYDE. You mean——

Colonel SUMNER. If we did not get the money this year, that is right.

Representative HYDE. Well——

Colonel SUMNER. I know I confused you. I have confused myself.

Representative HYDE. Yes, you have.

Colonel SUMNER. I think we will just have to face the fact that the time of that schedule would be delayed.

Representative HYDE. It would be delayed?

Colonel SUMNER. Yes, sir, if the additional money is not forthcoming.

Representative HYDE. Then by acceleration, it is not meant that you could have had your work completed before 1961?

Colonel SUMNER. That is correct.

Representative HYDE. But that if you did not get it, it might be sometime after that.

Colonel SUMNER. That is right, yes, sir.

Representative HYDE. Your earliest time now, regardless of the amount appropriated, would be 1961.

Colonel SUMNER. Yes. That is correct, yes, sir.

Representative HYDE. Physical considerations alone regulate that.

Colonel SUMNER. Yes, sir.

Representative HYDE. Mr. Gutheim, do you have any questions?

Mr. GUTHEIM. No questions.

Representative HYDE. Mr. Levin?

Mr. LEVIN. Colonel Sumner, if the study were completed by 1961 and if it were to recommend the construction of, say, River Bend Dam, how long after 1961 would it be before the reservoirs were in service?

Colonel SUMNER. Well, I will have to make some broad assumptions. Assuming that the recommendation was approved by Congress and the money appropriated in 2 years, say, you add 3 to 4 years more than that.

Mr. LEVIN. That would mean that we probably——

Colonel SUMNER. May I get confirmation of that figure on that? Six years.

Mr. LEVIN. Six years from now?

Colonel SUMNER. No; from the time the study——

Mr. LEVIN. Is completed?

Colonel SUMNER. Was completed and submitted to Congress, yes.

Mr. LEVIN. This would mean about 1967 as the earliest date that we could look forward to having that reservoir. Do you think before that time we might be in need of the water?

Colonel SUMNER. You might be in need of the water, yes. I am not—may I answer that later after a further check of my figures?

Representative HYDE. You may submit a later statement with respect to that, Colonel.

Colonel SUMNER. Yes. I would be guessing right now, Mr. Chairman.

Mr. LEVIN. This statement leads up to my final question, which is: If there is the likelihood that we may need this additional water supply before it could be made available to us, and of course we all know that much of this depends on the whim of the weather, is there any possible way that the study could be speeded up so that we could get the answer before 1961? Would additional funds, somehow, or some kind of additional assistance, allow at least that portion of the study which would decide on the water supply to be completed before 1961?

Colonel SUMNER. Well, I think that before we make any recommendation as to a dam at any place, we should consider the entire river, and the needs of the entire river, and the effect that a dam in one place would have at another location.

I would hate to do this piecemeal, because it might not be the integrated solution.

As to whether or not leaving out other elements of the study would speed it up, that is another question that I would like to spend a little time on and submit for the record, if it is agreeable to you, Mr. Chairman.

Representative HYDE. That is perfectly agreeable, Colonel. We will be glad to have it.

Colonel SUMNER. Thank you.

STATEMENT BY COL. GEORGE B. SUMNER, DISTRICT ENGINEER, UNITED STATES ARMY ENGINEER DISTRICT, WASHINGTON

Mr. Chairman, before discussing the specific problems of the Potomac River Basin report, I would like to introduce into the record the plan of survey for this study. This document which has been approved by the Office, Chief of Engineers contains a general plan of how this study is to be accomplished. The functions of all cooperating agencies are described in this document.

The question has been asked whether an increase in the appropriation for the study from $200,000 to $500,000 would enable completion of the study at an earlier date than June 1961. The answer to that is "no." But, if the appropriation for fiscal year 1959 should be increased to $500,000, it would be possible to advance materially the work of the cooperating agencies, so that it can be available in time to enable completion of the study by June 1961, and, also, provide at an earlier date information needed to make some of the general and basic decisions on a future water supply for the metropolitan area. Much of the work of these agencies is needed before other work can go forward, and unless it can be initiated early in fiscal year 1959 the completion date of the overall study will have to be extended.

The estimated cost of the study is $1,450,000, of which $140,000 was appropriated for and made available in fiscal year 1958. That leaves $1,310,000 required for completion of the study in fiscal years 1959, 1960, and 1961 with somewhat less required for the final year than in the 2 preceding years. (These figures do not include $200,000 appropriated for and expended under other titles.)

The question was also asked—is there a possibility of a water shortage in the Washington metropolitan area if additional reservoir storage is not available in 1967? The answer to that question in definitely yes, taking into account requirements for domestic water supply and pollution abatement only. There should be no shortage of water for domestic use only, provided the river flow does not get lower than it did in 1930. Pollution abatement requirements do not include any water to be used as a substitute for complete treatment of sewage of municipalities, but only that required to meet the BOD remaining after treatment, and for purification of pollution, including surface runoff so there will be sufficient water flowing past the domestic water intakes to enable the stream to meet the water quality standards by the Interstate Commission on the Potomac River Basin.

The accompanying chart gives a comparison of the water requirements expected in 1967 (domestic and the 650 million gallons per day generally considered to be necessary to prevent unsatisfactory conditions in the tidal estuary) with the 1930 low river flow.

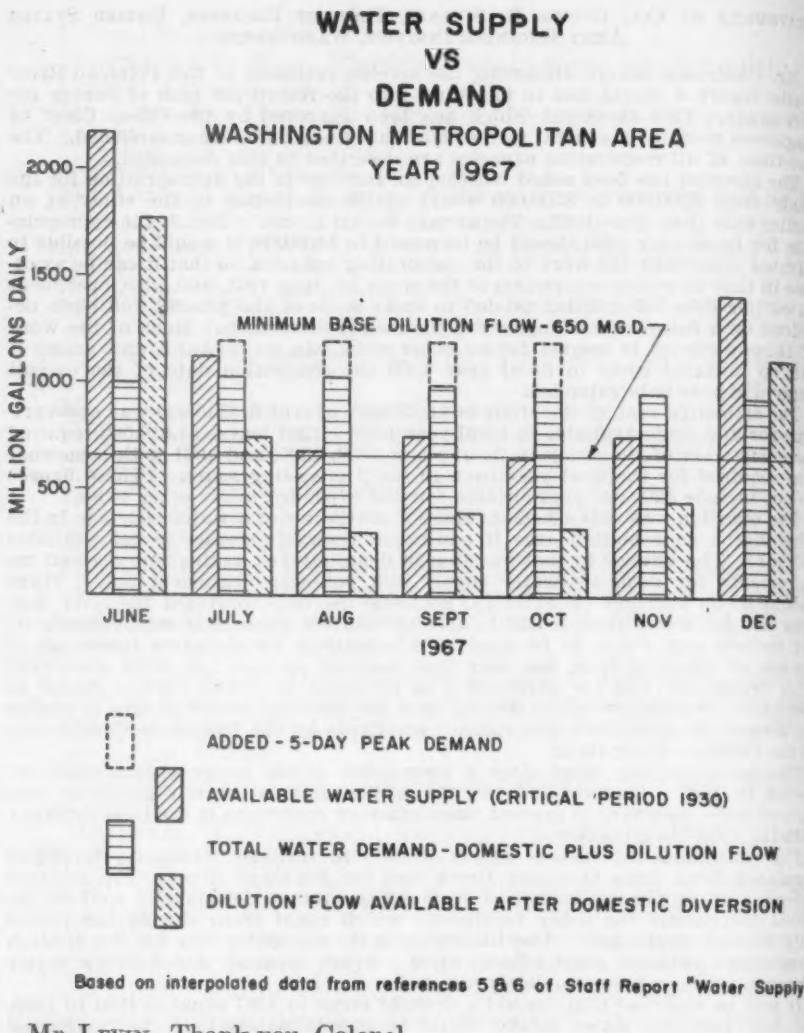
This minimum dependable supply illustrated includes maximum developed regulated flows from Occoquan Creek and the Patuxent River. The monthly averages of supply are compared to monthly average demands as well as the added increments for 5-day maximums which could occur during the period July through September. Also illustrated is the remaining flow left for dilution of sewage treatment plant effluent after average demands for domestic water consumption have been completely satisfied.

It will be observed that, should a drought occur in 1967 equal to that in 1930, the flow past the water intake would be approximately half the designated minimum requirements, and the requirements and corresponding shortage for 1968 and succeeding years will be progressively greater.

The figures used are of course tentative, as water requirements have not yet been developed in the study. Irrigation demands also are not included.

Immediate flood-control benefits from storage reservoirs have not been discussed but can be substantial.

The staff consultants are to be commended for the excellence of their reports. It has been the privilege of the Washington district, Corps of Engineers, to supply basic data and I wish to express to the joint committee my sincere desire that the splendid spirit of cooperation be continued. All pertinent data in process of compilation by the corps for this study will always be available for your information and use.



Based on interpolated data from references 5 & 6 of Staff Report "Water Supply"

Mr. LEVIN. Thank you, Colonel.

Representative HYDE. Thank you very much, Colonel. We appreciate your coming.

Our next witness will be Mr. Brown, of the Maryland State Department of Health.

Mr. Brown, for the record, would you give your full name and your affiliation, please, sir?

STATEMENT OF ROBERT M. BROWN, CHIEF, BUREAU OF ENVIRONMENTAL HYGIENE, MARYLAND STATE DEPARTMENT OF HEALTH

Mr. BROWN. Mr. Chairman, my name is Robert M. Brown. I am chief of the Bureau of Environmental Hygiene of the Maryland State Department of Health.

Representative HYDE. You may proceed, Mr. Brown.

Mr. BROWN. Mr. Chairman, I regret that I do not have a prepared statement. Our invitation to appear before your committee went astray within the department, and I did not receive it until yesterday.

I would like, however, to make some remarks. In doing so, I would like to give assurance I have in what I say no desire to appear glib or oversimplify issues, but if I can do so I would like to be as constructive and as positive as I can.

I would say, first, that I concur in the conclusions and recommendations with regard to the areas of water supply and sewage disposal as they have been set forth in the staff papers for the committee.

I also concur in the statements offered this afternoon by Mr. Auld and Mr. Tisdale as they relate to the joint participation of Maryland jurisdictions with the District of Columbia and with the Interstate Commission on the Potomac River Basin.

There are several issues which are of considerable concern to us. We are concerned primarily with eventual pollution or elimination of pollution as well as the provision of an adequate and pure source of water supply for the several jurisdictions within our responsibility.

The point upon which I would like to dwell, or the area, is that in which we are greatly concerned at the present, with preventing pollution of the Potomac and providing this pure source of water supply for the areas presently undeveloped to the northwest of the District of Columbia.

The areas of Montgomery County, to the northwest of the Washington Suburban Sanitary District, are in process of development. The pressures for residential housing in this area are increasing quite remarkably. I understand that this is similarly the case on the other side of the river in upper Fairfax County and in Loudoun County.

The objectives of preventing pollution and in assuring this unpolluted source of water supply should be supplementary. I submit that at the present time, that the measures we have for assuring they both be carried out are almost mutually exclusive.

In these areas, from the standpoint of sewage disposal, the water supply must come from the Potomac. The only place under present drainage patterns that sewage or treated sewage might be discharged is in the Potomac River.

Following this pattern of treating sewage at satellite communities and discharging it to the river produces a question merely of time until the river in this same vicinity is, let us say, degraded from the standpoint of providing the kind of raw water source that we should desire for the demands of these communities and the existing areas.

The problem, then, becomes one of a plan which should be in existence at the present moment for permitting the development to take place while accomplishing the prevention of pollution and assuring the supply of water. We do not have it.

We, at the present time, are collaborating with colleagues of ours in Virginia, and in the District of Columbia, with regard to working arrangements by means of which we can to some extent coordinate development, guide it in such a manner that its impact upon the river will be minimal, in anticipation of a plan which will accomplish these objectives about which I have been speaking.

In my judgment, the only manner in which a safe and adequate disposal of sewage from these upriver communities, as they develop, can be accomplished is by means of a conduit.

Representative HYDE. By means of what?

Mr. BROWN. A conduit to convey the sewage through the area in which it would pollute the river, this contemplating, according to the most admirable arrangement, conveying the sewage into the present joint facilities operated by the District of Columbia.

The problem of water supply, as it relates not only to purity but in providing an adequate amount for the growing demand for water, would of necessity require some sort of impoundment to provide guaranteed quantities during periods of low flow in the river.

The principal obstacle to the accomplishment of these objectives, again in my judgment, is that of finances. The case is very adequately stated in your committee report, your staff report on sewage disposal and water pollution, on page 24 under the heading of "Financing."

It points up here the major problem to which an answer has never been advanced, to my knowledge, that of the responsibility of the Federal Government in aiding these jurisdictions with unique problems in providing the means of dealing with these situations which involve not only the State and county areas of responsibility, but that of the seat of Government as well.

I would like to say a word with regard to the pattern of the administration of these services and pollution control activity as they have been discussed.

I have reservations as to whether some overall authority is required in order to accomplish these things. I think the most imaginative conception which has resulted in the creation and operation of the Washington Suburban Sanitary District, and the voluntary negotiation of a contract between that jurisdiction and the District of Columbia, has indicated the extent to which Maryland has gone and desired to go in meeting problems for which it is responsible.

Representative HYDE. Right there, excuse me, Mr. Brown, does not the success of the Washington Suburban Sanitary Commission also indicate the advisability and the workability of a regional approach to these problems? Is that not a regional approach?

Mr. BROWN. I don't question the regional approach, but——

Representative HYDE. Well, it is regional, both administratively and financially; is it not?

Mr. BROWN. Not necessarily.

Representative HYDE. No? How?

Mr. BROWN. The matter of the arrangement between the sanitary district and the District of Columbia is——

Representative HYDE. You misunderstand me, Mr. Brown. The sanitary district itself is a regional solution of administrative and financial problems in connection with water supply and sewage disposal; is it not?

Mr. BROWN. Quite true.

Representative HYDE. Yes.

Mr. BROWN. The point I wanted to emphasize is, however, that I wouldn't see at this point the necessity for an overall sanitary district including portions of Maryland and Virginia, displacing the Wash-

ington Suburban Sanitary District, for example, as a necessary means to accomplish the solution we are seeking.

For example, if this conduit for receiving sewage and transmitting it to a central treatment works were provided as a part or as the mechanism of the discharging of Federal responsibility in the area, into which conduit the several jurisdictions could at proper costs discharge their sewage, convey it to a central treatment works, again paying their fair proportionate cost of treating that sewage, that would not in itself require an overall authority in order to operate it.

This same pattern might very well follow with regard to the matter of water supply.

Here we do not have the difficulty of there being a waste product of water treatment which is going to cause pollution. Therefore, if a jurisdiction desired to obtain water supplies from the District of Columbia and that could be negotiated, that would be all well and good.

If, on the other hand, they desired to provide their own water-treatment works and obtain their raw water from this pooled guaranteed source, treat it and dispense it, that will then be a matter of local determination. They can very well do it, weighing the costs to themselves as over against the cost of buying it from perhaps a central treatment works.

Representative HYDE. You go ahead, and I will ask further questions later, Mr. Brown.

Mr. BROWN. Perhaps the major emphasis, if I can place it, in concluding what I would say, is that the State Board of Health in Maryland is keenly aware of its responsibility in the area that I have discussed. It, together with the department which I represent, is anxious to lend itself in any way possible to the constructive solution of these difficulties.

The thing that we are most anxious to achieve is a protection of the public health as it relates to the quality of the river in the area to the northwest of the District of Columbia, where it has not yet been despoiled and where the pressures in the direction of reversing that are increasing day by day.

Representative HYDE. Does that conclude your statement?

Mr. BROWN. Yes, sir.

Representative HYDE. One thing that interests me: At the start of your remarks you said you agreed with certain conclusions in the committee's reports, and you also agreed with statements made by Mr. Auld and Dr. Tisdale.

Well, I detect some slight differences of opinion between the two. Would you clarify for the record wherein you agree with the committee's reports and wherein you agree with Mr. Auld and Dr. Tisdale?

Mr. BROWN. I particularly—I will put it this way: With regard to the statements made by Mr. Tisdale, I subscribe quite thoroughly to the proposals advanced for coordinating measures for securing the understanding and support of the people in the several jurisdictions involved here.

We have frequently been confronted with apathy as various of these objectives were advanced, because the people did not understand their nature. They were not perhaps at the moment experiencing a problem.

Consequently, as the mechanism which I understood him to explain, and desired to expand, for accomplishing this is something with which we wholeheartedly agree, that, to my understanding, is one of the major objectives of the Commission at the present time.

Representative HYDE. You mean expansion of the interstate commission?

Mr. BROWN. No, sir. Expansion of the activities for acquainting the public with needs for control of pollution in the Potomac watershed and in developing the resources to meet most adequately the community needs.

Representative HYDE. I think the public is acutely aware of the need for doing something about this pollution problem. What they are doing is looking for the so-called powers that be to find a decent and workable administrative solution.

Mr. BROWN. On the other hand, however, they desire to go on without restraint in the building of new communities, which in itself produces the polluting materials contributing to the problem.

Representative HYDE. Wherein did you agree with the committee reports? In what respect do you agree there?

Mr. BROWN. With the statements made with regard to the development of joint facilities, with the division of central services insofar as they can be provided; and the area in which I do not agree is in that which would perhaps imply the necessity for an overall authority to administer them.

Representative HYDE. That is sort of along the lines of what we have been hearing so far, is together in everything in fact but not in form. Is that right? Would that be a proper conclusion?

Mr. BROWN. It could be.

Representative HYDE. Doctor, there is one thing that has always puzzled me, and that is the extent of Maryland jurisdiction over the river. I realize we are in sort of a little battle regarding fish and oysters right at the moment, but on this question of pollution, Maryland says it has title to the river to the low-water mark on the Virginia side.

To what extent, if any, does that give Maryland any jurisdictional control outside, of course, where it goes entirely through the District of Columbia? To what extent does that give Maryland any jurisdictional control over the river so far as its pollution is concerned?

Mr. BROWN. You mean from other than the Maryland side?

Representative HYDE. Yes. Has it ever been tested? Let me ask you that first.

Mr. BROWN. To my knowledge, it has not. We, however, have just recently participated, last August and again in March, I believe it was, in the hearings conducted by the Public Health Service under Public Law 660, with regard to determining the nature and adequacy of the controls which have been exercised by Virginia, Maryland, and the District of Columbia, in meeting this problem, lending our support to the fullest extent possible to having the other jurisdictions do no less than what Maryland has already done on its side.

We have not, however, attempted to, as yet, take any unilateral action with regard to what may be discharged into the river from the Virginia side or from West Virginia or any other area outside of Maryland.

Representative HYDE. Speaking of this fear of "super" control, so to speak, using the word "super" in quotation marks, it is true, is it not, at the present time the Surgeon General of the United States, under existing Federal law, would have authority to control pollution on an interstate river such as in Maryland? Is that right?

Mr. BROWN. That is my understanding.

Representative HYDE. Do you not think it would be more desirable to do it on an interstate basis rather than on a Federal basis?

Mr. BROWN. Are you speaking about enforcement now?

Representative HYDE. Control of pollution.

Mr. BROWN. If it is necessary to have such control exercised, I would say, yes.

I would say further that I do not fear the superagency. I merely have reservations with regard to whether it is necessary, due to the manner in which matters have worked out so successfully on the Maryland side without it.

I believe that the same thing could be accomplished on the Virginia side as that jurisdiction has in mind to accomplish the same thing.

Representative HYDE. Any questions?

Mr. GUTHEIM. No. I think Dr. Brown's testimony has been extremely helpful in building up, to my mind certainly, a conception of what could be done by improved governmental relations, intergovernmental relations among bigger and stronger building blocks of the whole metropolitan system, so to speak, as opposed to one united, single-purpose authority.

Is there any possible reference that you could make to experience in other cities, either in Maryland or elsewhere, which would be analogous to the experience we have here?

Mr. BROWN. I appreciate your asking me that question. It recalls an example I did want to cite, which involves Baltimore city.

The city of Baltimore has central facilities for both water supply and sewage disposal. By a somewhat similar contract arrangement, it has supplied for quite a number of years all of the water supply to the Baltimore County Metropolitan District. It has made available, again through engineering and contract arrangements, its interceptors for diverting them to the back river sewage plant where they are treated and discharged.

The agreement with the city has also extended to some extent to Anne Arundel County, to the south of the city, and arrangements are underway for this same sort of service to be accomplished for areas of Howard County to the west.

Mr. GUTHEIM. So this is a system which could be described as in a state of evolution?

Mr. BROWN. Continually so.

Mr. GUTHEIM. Could you make some reference at this point to the study that is now going on under the direction of Mr. Sheidt of the Baltimore Regional Council? I understand they are giving consideration to water and sewage problems in the total range of things they are getting into.

Mr. BROWN. Yes, sir. I am chairman of the committee which is working on that particular development.

The pressure for development of residential housing exists within this area which is now within the Baltimore Regional Planning Council, just as it exists in the area around the District of Columbia.

The problem which these pressures produce to accomplish development beyond the reach of sewers utilizing individual sewage disposal systems, in our judgment, ultimately defeats the orderly economical extension of sewers.

Within the framework of possible arrangements between the county and the city for receiving sewage and supplying water, the committee of the regional planning council is attempting to develop a report on policy procedure by means of which development utilizing the individual facilities will be restrained, whereas development utilizing the public services will be encouraged.

This would, in itself, then, if it can be successfully applied, encourage the peripheral development, that is, by the extension of the fringe, by means of the public services conveying the waste to the central system rather than our having to contend, as we now do so abundantly, with the leapfrogging small satellite communities which can be dealt with satisfactorily neither by the individual systems nor by the multiple temporary or permanent sewage-treatment facilities.

Mr. GUTHEIM. That is all.

Representative HYDE. Mr. Levin?

Mr. LEVIN. Thank you, Mr. Chairman.

Mr. Brown, the essence of the sewage problem in the metropolitan area, I believe could be defined as choosing between the approach of a consolidation of sewage collection and treatment facilities versus the concept of treating at local plants, collecting and treating at local plants.

In the material which I reviewed concerning the latter, which is the policy in Virginia, I was unable to find any reference, in the documents that led to that decision, to public health.

As a matter of fact, the words "public health" did not appear.

I wonder if, as a health official and public-health engineer, you could tell us something about the public-health implications of the two very different methods of collecting and treating and discharging of sewage.

Mr. BROWN. At any point that a sewage-treatment plant exists, there is always potential hazard of discharge of untreated sewage for various reasons—plant failures, overloadings, breakdowns in mechanical equipment, and so forth.

With the development of multiple sewage-treatment plants, you proportionately multiply the potential hazard of these breakdowns occurring.

It is generally regarded as a much safer procedure, from the public-health viewpoint, to convey as much sewage to an adequate treatment plant at a single point than it is to to treat it as discharges at local points.

Mr. LEVIN. Do you think these public-health implications are sufficiently strong to be taken into consideration along with purely economical considerations in deciding on treatment works?

Mr. BROWN. I do not think I can come to any other conclusion.

Mr. LEVIN. Thank you.

That is all, Mr. Chairman.

Representative HYDE. Thank you very much, Mr. Brown. We appreciate having the benefit of your testimony.

Mr. BROWN. I appreciate being here.

Representative HYDE. Mr. Atkins?

Mr. Atkins, for the record, will you give the reporter your full name and your affiliation?

STATEMENT OF C. H. ATKINS, REGIONAL ENGINEER, PUBLIC HEALTH SERVICE, UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. ATKINS. Yes, sir.

My name is C. H. Atkins. I am regional engineer of the United States Public Health Service, region III, Health, Education, and Welfare Department, headquarters at Charlottesville, Va.

This region covers the States or includes the States of Maryland, Virginia, West Virginia, and the District of Columbia, among others, and that is why—our interest of operations in this area is why I am here to present a statement.

As you know, the Public Health Service carries on considerable activities in the area of general health services, cancer control, heart disease, hospital construction, milk and food sanitation, water supply and water pollution control all in close coordination with State and local health agencies or in the case of water pollution control with the interstate commission on the Potomac River Basin, and also with the State water pollution control agencies which in this case, is the Maryland State Health Department, the water commission, the District of Columbia Health Department, and the Virginia Water Control Board.

I might say that as we understand it this committee is interested primarily in the water supply and water-pollution activities, that we are concerned with, and therefore, my comments will be restricted to that area. But I wanted to mention the broader aspect and interest in the region of public health service.

Now our responsibilities and activities pursuant to congressional authority under Public Laws 410 and 660 relate to both water supply and to the water pollution control. Under the water supply, we are concerned, our legal responsibility rests under the interstate quarantine regulations that is that theater, the sources of water for interstate carriers, the railroads, airlines, ships, we have to, in close cooperation with the District of Columbia Health Department in this case, inspect the water source and carry through the distribution system and determine whether the water is satisfactory for use in interstate carriers and of course I am happy to state that the District of Columbia water supply has been judged of satisfactory sanitary quality for this purpose and it has been approved by the Public Health Service.

Now under the other authorization with respect to water pollution control, we have a program for grants to State water pollution control agencies and in this act, the District of Columbia is defined as a State for the purposes of the legislation—grants to those control agencies to strengthen and expand their water pollution control programs, that is what we call program grants.

We have authorization and funds also for grants to municipalities. In close cooperation and in consultation with water pollution control agencies, we grant funds to the municipalities to assist them in the construction of sewage-treatment works.

A third area is the interstate enforcement of where there is pollution of significant—doing significant damage that the surgeon general is authorized or directed under the law to call conferences, that being the first step and it could go on to hearings and even to court, if necessary, to secure the abatement of interstate situations endangering the health and other water uses.

Now another activity is to carry on studies——

Representative HYDE. Excuse me, Mr. Atkins.

You say you have that authority now with respect to pollution?

Mr. ATKINS. Yes, sir.

Representative HYDE. To what extent does a health service exercise it?

Mr. ATKINS. Well, sir, under Public Law 845 we had one major case, I believe, as I recall, which was in Louisiana.

Under Public Law 660 which really constituted some amendments to Public Law 845, we have had several conferences. This latter legislation provided for the conference technique before we could go into a hearing or into court and we have had several conferences, two sessions, and in the Missouri River Basin we have had several ranging from back in Nebraska on downstream to St. Louis and there have been others, I am certain about that although I am not familiar with them.

Representative HYDE. Where—what was the area affected by the conferences in this basin?

Mr. ATKINS. The area was the Washington metropolitan—the consideration of the interstate polution problem of the Washington metropolitan area.

The first conference was held in Charlottesville, Va.—that is our headquarters for the region—in August, and the latter one was held here in Washington in February.

Representative HYDE. Last one in February of this year?

Mr. ATKINS. That is right. We had two sessions, and I might add that the State, interstate agencies concerned, the States having their State agencies and the District of Columbia government were all represented in the conferences, and came to an agreement which seemed—it looks encouraging.

Representative HYDE. An agreement with respect to what; standards?

Mr. ATKINS. As to, well, the interstate commission is working on the standards for the stream, but an agreement on the work schedule for the pollution abatement, and in the District of Columbia as well as on the Virginia side.

Representative HYDE. Thank you.

Mr. ATKINS. Yes, sir. I have here a prepared statement, Mr. Chairman, sir, that covers in more detail than I have given in this brief comment of our activities in the water supply and water pollution and control field in the Potomac River Basin. I would be happy to read this statement or to present it for the record, to conserve the time of the committee.

Representative HYDE. I think, in the interests of time, we can receive it in the record at this time. You can elaborate on any point in it that you think might deserve further explanation, if you wish.

Mr. ATKINS. Yes, sir.

(The document is as follows:)

PUBLIC HEALTH SERVICE ASSISTANCE TO THE WASHINGTON METROPOLITAN AREA ON PROBLEMS OF WATER SUPPLY AND WATER-POLLUTION CONTROL

Statement of C. H. Atkins, regional engineer, Public Health Service, United States Department of Health, Education, and Welfare

Authorizations of the Federal Water Pollution Control Act and the Public Health Service Act under which the Public Health Service has provided direct assistance to the Washington metropolitan area include:

1. Technical assistance to States and interstate agencies relating to the prevention and control of water pollution, and cooperation with them in the preparation and development of comprehensive programs for water-pollution control.
2. Grants to States and interstate agencies up to $3 million a year for extension and improvement of pollution-control activities.
3. Grants of $50 million a year (authorization) to municipalities for construction of sewage-treatment works.
4. Abatement of interstate water pollution through Federal enforcement procedures.
5. Conduct of studies and demonstrations relating to the causes and control of diseases, including water purification and sewage treatment.
6. Promulgation of regulations to prevent the interstate transmission of diseases (e. g., the program for certification of water supplies for use by interstate carriers).

WATER-QUALITY STUDIES AND TECHNICAL ASSISTANCE

Studies to aid in the solution of water-pollution problems were authorized first in Federal legislation enacted in 1912. In 1913–14, under this authorization, the Public Health Service made one of the first comprehensive studies of stream pollution in this country on the Potomac River. Since that time, the Public Health Service, either independently or in cooperation with other interested agencies, has investigated pollution of the Potomac River in the Washington metropolitan area for various reasons on an average of once every 10 years. A more detailed review of these studies is included in the recent Public Health Service report, A Review of Interstate Pollution, the Potomac River in the Washington Metropolitan Area, which was used as a basis for the interstate pollution conference discussed later in this statement. This report also discusses all facets of the problem, including present and future water uses, water-quality objectives for various sections of the river, and pollution-control measures needed and their estimated costs.

Starting in fiscal year 1957, the United States Public Health Service, in cooperation with the Corps of Engineers, Department of the Army, has been engaged in a comprehensive study of water quality in the Potomac River Basin, with special reference to present and future uses of the waters for municipal and industrial supply and for waste disposal, and to the impact of the Corps of Engineers' proposed water resource development program on such water quality and use.

Economic benefits of proposed reservoirs are being evaluated from the standpoint of water quality. Practical means for improvement of water quality are being considered, with emphasis on alternate methods of reservoir operation.

During fiscal year 1957, the report on the North Branch Potomac River was completed, and is now undergoing final review. During fiscal year 1958, the United States Public Health Service initiated a preliminary investigation of water quality in other parts of the Potomac River Basin. These efforts have been directed to collection of available data and to preliminary review of problem areas in the field.

A start has been made on analysis of available data, with special attention to the data on the Washington metropolitan area.

Scheduled for completion by the close of fiscal year 1958 or soon thereafter is a preliminary report which will include, to the degree possible, evaluation of existing water quality in problem areas, special consideration of the Washington metropolitan area problem, and a schedule of special studies referred for necessary additional data.

During fiscal year 1959 through fiscal year 1961 it is planned to conduct necessary field studies of the main-stem Potomac River tributaries and complete the final report.

PROGRAM GRANTS

Under section 5 of the Federal Water Pollution Control Act, grants have been made to Virginia, Maryland, District of Columbia, and the Interstate Commission on the Potomac River Basin which have affected pollution-control activities in the Washington metropolitan area. The amounts of these grants for fiscal years 1950, 1951, 1952, 1957, and 1958, when funds were appropriated, are included in the tabulation attached (exhibit A). Examples of the use of these grants by the Interstate Commission on the Potomac River Basin in a manner which has been helpful to the Washington metropolitan area are the recent study and report entitled "A Clean Potomac River in the Washington Metropolitan Area" by consultants from the Johns Hopkins University. In addition, the commission has been able to expand its public-information program, which has resulted in greater awareness and desire to act concerning pollution abatement than ever before.

CONSTRUCTION GRANTS

The United States Public Health Service has rendered other financial assistance to the Washington metropolitan area under the Federal Water Pollution Control Act through direct grants to cover part of the cost of construction of sewage-treatment works. Fifteen projects, costing Maryland and Virginia communities in this area and the District of Columbia a total of over $12 million, have received almost $1½ million in grants during the present and previous fiscal years (exhibit B).

WATER-POLLUTION ENFORCEMENT

Also under the authority of the Federal Water Pollution Control Act, the Public Health Service has initiated enforcement procedures in the matter of pollution of the interstate waters of the Potomac River in the Washington metropolitan area. The initial action, as required by the act, has been the holding of a formal conference of water pollution control agencies of the District of Columbia, Maryland, and Virginia, and the Interstate Commission on the Potomac River Basin. At the two sessions of this conference held on August 22, 1957, and February 13, 1958, the conferees agreed on the extent of the water-pollution problem in the Washington metropolitan area, the schedule for construction of pollution-abatement facilities by the District of Columbia (the most important source of pollution in the area), the provision of waste treatment by other communities in the area commensurate with the District of Columbia construction schedule, and the continued surveillance and reporting of progress by the Public Health Service while the further role of the Federal Government in the pollution abatement program is defined. The complete summary of the conclusions and recommendations agreed to by the conference is attached (exhibit C).

URBAN AREA SANITATION STUDIES, FAIRFAX COUNTY

In view of the increasing national concern with the broad aspects of urban-area sanitation, the Public Health Service is planning studies of sanitary engineering problems in selected urban areas. These studies, in cooperation with State health departments, are directed toward developing information which will aid in solving problems of providing sanitary services in expanding urban areas.

Fairfax County in the Washington metropolitan area represents an example of an urban area where sanitary facilities are being provided principally under a program of cooperation. This county was, therefore, selected for a pilot study which will include a review of water supply, sewerage, solid waste disposal, and other sanitation practices. Preliminary negotiations for the study already have been made with State and county officials.

WATER SUPPLY CERTIFICATION

During 1956, there was established, under the authority of the United States Public Health Service, a Committee on Certification of the District of Columbia Water Supply, consisting of representatives of the District of Columbia Department of Sanitary Engineering and Public Health; the Corps of Engineers, Department of the Army; the Interstate Commission on the Potomac River Basin; and the Public Health Service, Department of Health, Education, and Welfare. The activities of the committee have included study and evaluation of the existing system and facilities and sanitary defects for the purpose of recommending whether the supply should be classified with respect to its use as an interstate carrier watering facility.

As a result of this study, the committee recommended and the United States Public Health Service concurred that the supply classification be changed from "provisional" to "approved."

In its final report (December 1956) the committee, among other things, listed the sanitary defects found in the water supply system. In its December 1957 progress report, the committee recognized that "many improvements involving the correction of defects in the water treatment plants and the distribution system have been made in line with the recommendations contained in the 1956 report. * * *" The committee recommended that the improvement program be continued in order to insure an adequate supply of potable water. It also emphasized the need for the development and adoption of a Washington metropolitan areawide plan for water supply and waste disposal before future needs can be met.

EXHIBIT A

Federal program grant payments to States involved in the Washington metropolitan area, the District of Columbia, and the Interstate Commission on the Potomac River Basin

	Fiscal year 1950	Fiscal year 1951	Fiscal year 1952	Fiscal year 1957	First three quarters of fiscal year 1958
District of Columbia	$10,304	$9,800	$6,373	$10,075	$8,000
Maryland	13,216	12,800	12,500	33,907	37,500
Virginia	17,774	17,300	17,400	38,738	45,680
Interstate Commission on the Potomac River Basin	(1)	(1)	(1)	17,544	21,371

[1] No information.

EXHIBIT B

TABLE 1.—*Summary*

Projects receiving Federal funds	No.	Estimated project cost	Grant offers as required
In Washington metropolitan area	14	$12,858,438	$1,381,848
Additional projects in Potomac Basin	10	1,805,689	390,501
Additional projects requesting Federal funds in Potomac Basin	2	2,530,000	262,000
Total	26	17,194,127	2,034,349

TABLE 2.—*Sewage treatment projects receiving Federal grant funds in the Washington metropolitan area*

State	Community	Estimated total project cost	Grant offer	Agency
District of Columbia	District of Columbia [1]	$6,792,078	$250,000	District of Columbia.[2]
	do	375,000	112,500	Do.
Maryland	Cabin John	129,720	35,383	Washington Suburban Sanitary Commission.[3]
	Gaithersburg	997,300	148,000	Do.
	Laurel [1]	1,264,326	250,000	Do.
	Rockville [1]	18,690	3,738	Municipal.[5]
	Rockville [4]	1,000,480	250,000	Washington Suburban Sanitary Commission.
	Sligo Branch [1]	137,930	27,486	Do.
Virginia	Arlington	298,246	77,071	Arlington County.[6]
	Dogue Creek	372,200	38,248	Fairfax County.[7]
	Fairfax [1]	682,297	77,071	Municipal.
	Herndon [1]	131,654	11,654	Do.
	Holmes Run [1]	435,313	35,350	Fairfax County.
	Little Hunting Creek [1]	223,204	11,654	Do.
Total		12,858,438	1,381,848	

[1] Project under construction.
[2] District of Columbia municipal government.
[3] Washington Suburban Sanitary Commission.
[4] Project completed.
[5] Local municipal government.
[6] Arlington County, Va.
[7] Fairfax County, Va.

TABLE 3.—*Sewage treatment projects receiving Federal grant funds in the Potomac River Basin excluding the Washington metropolitan area*

State	Community	Estimate total project cost	Grant offer	Agency
Maryland	Emmitsburg	$339,185	$67,837	Municipal.
	Hagerstown [1]	308,393	92,517	Do.
	Leonardtown [1 2]	158,400	47,520	Do.
Pennsylvania	None			
Virginia	Colonial Beach [1 2]	300,477	58,280	Do.
	Dumfries [1 2]	114,199	20,471	P. W. Co.[3]
	Elkton [1]	42,828	6,109	Municipal.
	Front Royal [1]	166,737	11,892	Do.
	Woodstock [1]	122,120	12,520	Do.
	Occoquan [2]	164,800	28,790	P. W. Co.
West Virginia	Moorefield	148,550	44,565	Municipal.
Total		1,805,689	390,501	

[1] Project under construction.
[2] Downstream from Washington, D. C., metropolitan area.
[3] Prince William County, Va.

TABLE 4.—*Sewage treatment projects in the Potomac River Basin, reported in preparation which may request Federal construction grants*

State	Community	Estimate total project cost	Grant offer	Agency
District of Columbia	Blue Plains	$2,490,000	$250,000	District of Columbia.
Maryland	None			
Pennsylvania	None			
Virginia	Alexandria	40,000	12,000	Alexandria Sanitary Authority [1]
West Virginia	None			
Total		2,530,000	262,000	

[1] Alexandria Sanitary Authority.

EXHIBIT C

EXCERPT FROM SUMMARY OF CONFERENCE ON POLLUTION OF INTERSTATE WATERS, POTOMAC RIVER, WASHINGTON METROPOLITAN AREA, AUGUST 22, 1957, AND FEBRUARY 13, 1958

In the light of conference discussions, the conferees agreed to the following conclusions and recommendations:

1. That cognizance is taken of the work done by the official water pollution control agencies of the District of Columbia, Maryland, and Virginia, and the Interstate Commission on the Potomac River Basin in recognizing, analyzing, and acting to secure abatement of pollution of the interstate waters of the Potomac River, Washington metropolitan area;

2. That cognizance is taken of the remedial facilities installed by the District of Columbia, Maryland, and Virginia political subdivisions to abate such pollution;

3. That the District of Columbia will provide secondary treatment (including chlorination of the effluent when necessary) at its Blue Plains plant by 1958 that will remove 80 percent of the waste load going through that plant as measured by B. O. D.;

4. That the District of Columbia will make further improvements to the Blue Plains plant which will be completed by 1965. These improvements will provide full secondary treatment which will result in the continued removal of 80 percent of the wastes going through the plant as measured by B. O. D.;

5. That the District of Columbia make plans sufficiently in advance so that additional construction which may be necessary beyond that contemplated to be completed by 1965 will be accomplished so that discharges from the Blue Plains plant will not again become a significant source of pollution of the Potomac River (Washington metropolitan area);

6. That the District of Columbia, in order to reduce pollution of the Potomac River (Washington metropolitan area) from storm water overflows, put into effect plan C (except the Rock Creek interceptor) as proposed by the Board of Engineers in its report to District of Columbia Department of Sanitary Engineering on improvements to sewerage system dated February 28, 1957; and that the construction of these remedial facilities be completed by the end of 1966; and appropriate financial arrangements be made to accomplish this;

7. That the Virginia communities in the Washington metropolitan area will provide treatment commensurate with those provided by the District of Columbia and Maryland political subdivisions;

8. That processes be initiated to define what responsibility the Federal Government should have in the program to abate pollution of the Potomac River in the Washington metropolitan area;

9. That the official State water pollution control agencies of the District of Columbia, Maryland, Virginia, and the Interstate Commission on the Potomac River Basin cooperate with each other in the provision and exchange of information on a continuous sampling program of the quality of water of the Potomac River, Washington metropolitan area; and

10. That the Public Health Service will report to the other conferees as to progress at 6-month intervals.

Mr. ATKINS. There are some corrections that I would like to make. There are three on the first page, if I might.

Under item 2, the figure of $3 million I would hope that that, "Up to $3 million a year" could be eliminated and under item 3, eliminate "of $50 million a year (authorization)"—just eliminate those 2, because that applies to the national program and does not apply, only a part of it applies to the Washington metropolitan area.

There are tables in the back that give the figures of these grants, both program and construction grants that apply to the Washington, D. C., area.

One correction, not a correction, but an addition to the table in the back which lists the construction grants and that is to add one for the District of Columbia government for additions to the Blue Plains treatment plant and that was too late to get into this tabulation.

That completes my statement, sir, unless there are some questions.

Representative HYDE. Thank you.

Mr. Gutheim, do you have any questions?

Mr. GUTHEIM. No, sir.

Representative HYDE. Mr. Levin?

Mr. LEVIN. Mr. Atkins, the Public Health Service is in the position to lead the thinking of the Nation in terms of water supply and sewage disposal planning.

I believe that should be a function of the Service.

Has it given any consideration to the period of the future for which plans should be made when large or substantial sanitary works must be planned?

Mr. ATKINS. Well, I appreciate your comments and confidence, sir.

Actually we do not get, so far as I know, into the planning of detailed projects or the engineering design; and, as I interpret your question, is it the length of time that a facility for sewage treatment or waterworks should be planned engineeringwise?

Mr. Levin, I would answer as an engineer and say from 20 to 30 years and perhaps longer for water supply.

That would be my figure.

Mr. LEVIN. In connection with this superauthority concept that we have been discussing today, when Public Law 660 was proposed, was not there fear on the part of individual jurisdictions that this might constitute, in effect, some kind of superauthority control that would really reduce the rate of construction of sewage-treatment works rather than enhance the rate of construction?

What has been the experience under that law?

Mr. ATKINS. Well, there was fear, I think, in the enforcement provision there of some agencies that their authority would be usurped, as a possibility, by the Federal Government.

In the preamble of the law it states the policy of the Congress to give consideration to the States-rights angle and due consideration shall be given to their rights and responsibility for the control of pollution and so forth.

But aside from that the Public Health Service has enjoyed, I think, a long history of working with State agencies and has developed effective working relationships with both the State health agencies and in cases where there are separate jurisdictions, the State water pollution control agencies.

Now that was on the enforcement side.

There was apprehension also as to the construction grants section of the law, whether or not it would increase the rate of sewage and treatment construction, and I must say in both cases we are delighted at the reception and the experience thus far in the program which is thus far barely over—well, it has been operating close to 2 years now, and we feel that the construction has been considerably accelerated, and we also feel that the type of conferences we have had under the enforcement section have been in the nature of informal hearings of getting the responsible people together and working out a common solution rather than anticipating Federal court action.

So on both scores I would say it has been very successful.

Mr. LEVIN. When you came back from your stint in India, you talked to a group of us about some of the problems there in relation to filth-borne diseases.

I thought that was an extremely interesting talk. I wonder if you recall some of the figures or could briefly tell us something about how bad water pollution can really be, so that we can focus a little attention on the public-health aspects of abating pollution.

Mr. ATKINS. Well, sir, the problem, of course, is a much more and vastly different culture in living patterns than we have here. But I might cite some figures roughly, as I recall.

There were some 2 million deaths a year from cholera, typhoid, and other water filth borne diseases.

The streams near cities are heavily polluted with a small amount of sewage that went in, relatively small amount, as compared to the population.

One factor in favor of India regarding stream pollution as such is that much of the sewage does not reach the streams except in the high water when there is a heavy runoff, that it is around the village or in the town and then it presents many public-health problems before it gets to the streams.

Here we have sewers that lead into the streams or to a treatment plant and there our headaches and problems concentrate.

There are other factors involved in it but I hope that that gives you some idea.

Does it answer your question?

Mr. LEVIN. It does.

We have not experienced, fortunately we have not experienced, cholera outbreaks nor large typhoid outbreaks in the metropolitan area in recent years, which is largely due to increased sanitation.

Do you have or does the Public Health Service have sufficient data at this time, however, to equally conclude that perhaps minor enteric diseases are or are not caused by water pollution conditions as we know them today?

Mr. ATKINS. Well, the epidemiology of course is lacking. Statistically, I would say that we do not have data to give a wide and a well-based statistically significant picture but we do have reason to believe that there are outbreaks of various types of diseases, some virus borne, and others that have as their origin unsanitary method of excretia disposal.

That is beginning with our more primitive methods of privies or lack of them, then into the spetic-tank area in the metropolitan complexes, and then in the communities' sewage treatment plants and finally into the streams where we have inadequately treated the sewage going in.

So the answer in my opinion is that there are outbreaks of disease that do occur from those sources.

I would hasten to add too, that we are becoming equally concerned about the chemical, the toxic wastes going into streams.

From the standpoint of toxicity from our vastly growing use of chemical products like insecticides, and so forth, that flow and find their way ultimately into our streams, detergents, I do not want to oversimplify it, but it is not hard here to find in the Washington area detergents.

What the physiological effects of those types of wastes that many of them go through our water treatment plans are in the long run we do not know.

We are working on that very problem under authorization in Public Law 660 and our sanitary engineers.

Mr. LEVIN. Then in terms of the public health problems of disease, it would be more beneficial to the public health to collect and remove the sewage from the built-up area for treatment and discharge in a relatively unpopulated area; is that correct?

Mr. ATKINS. In general I would say, certainly, yes.

Communities go through stages. We have had experience in metropolitan Washington with septic tanks, and some of those still new in those communities are replaced by community systems.

But certainly the septic tank with unsuitable soil conditions, the overload, and so forth, creates many health hazards very close to people and where kids play.

Your community sewage treatment plant is farther removed from close proximity to children's playgrounds, and so forth, but it still is generally speaking, closely located to the community population, whereas your major areawide, so to speak, sewage treatment plant removes both those types of hazards downstream and preferably into the nonpopulated area and then would give it such treatment as the water use below required both from a standpoint of public health as well as conservation, recreation, fish and wildlife.

Mr. LEVIN. Thank you very much.

Representative HYDE. Thank you.

Mr. GUTHEIM. Mr. Chairman, may I introduce at this point in the record a statement prepared by Representative Blatnik who has been obliged to return to Minnesota today?

I will not take the time to read it, but Representative Blatnik is endorsing the recommendations made by the conferees representing Maryland and the District of Columbia and Virginia in the Public Health Service proceedings last February.

Representative HYDE. It will be received in the record at this point.

(The statement is as follows:)

STATEMENT OF REPRESENTATIVE JOHN A. BLATNIK

I welcome this opportunity to participate in your committee's study of the Washington metropolitan area. The growth of vast urban regions everywhere is obliging us to reexamine our national water policies. Not only are great cities major factors in stream pollution, but they present formidable problems of organization for pollution control, as well.

To further a more unified attack on metropolitan area stream pollution problems, I have introduced H. R. 11714 which would amend the grant section of the Federal Water Pollution Control Act to allow several municipalities to unite in the sponsorship of a single pollution control sewage treatment plant project. In the Washington metropolitan area, as elsewhere, this provision would further the unified management of pollution control activities.

This bill is important to the Washington metropolitan region since it is the second fastest growing large city in the Nation. Among cities with a population of more than 1 million, only 1 exceeds this growth. There is a direct relationship between this swelling urban population and its consequences in stream pollution. In the broad effort to insure a more orderly and adequate form of suburban growth, a high place should be given to organized sewage disposal systems. Not only do they alone meet fully the sanitary requirements of urban populations, but they influence the pattern of home building and thus promote a more orderly pattern of suburban development.

The Federal Government has unique responsibilities toward the District of Columbia, especially regarding the cleaning up of the Potomac. Due to large Federal holdings here, the District government's source of revenue is limited.

Moreover, the fact that this is the Nation's Capital—literally the crossroads of the Nation and the world—demands that the Potomac should be a source of pride to us all rather than the foul green and brown cesspool it has become since the abrupt expansion of the area's population during the war years.

The most immediate Federal action that will help clean up the Potomac is to follow the recommendations made by the conferees representing Maryland, the District of Columbia, Virginia, the Interstate Commission on the Potomac, and the Public Health Service in proceedings initiated under the provisions of the Federal Water Pollution Control Act. These recommendations are as follows:

1. That cognizance is taken of the work done by the official water pollution control agencies of the District of Columbia, Maryland, and Virginia, and the Interstate Commission on the Potomac River Basin in recognizing, analyzing, and acting to secure abatement of pollution of the interstate waters of the Potomac River—Washington metropolitan area;

2. That cognizance is taken of the remedial facilities installed by the District of Columbia, Maryland, and Virginia political subdivisions to abate such pollution;

3. That the District of Columbia will provide secondary treatment (including chlorination of the effluent when necessary) at its Blue Plains plant by 1958 that will remove 80 percent of the waste load going through that plant as measured by B. O. D.;

4. That the District of Columbia will make further improvements to the Blue Plains plant, which will be completed by 1965. These improvements will provide full secondary treatment which will result in the continued removal of 80 percent of the wastes going through the plant as measured by B. O. D.;

5. That the District of Columbia make plans sufficiently in advance so that additional construction which may be necessary beyond that contemplated to be completed by 1965 will be accomplished so that discharges from the Blue Plains plant will not again become a significant source of pollution of the Potomac River (Washington metropolitan area).

6. That the District of Columbia, in order to reduce pollution of the Potomac River (Washington metropolitan area) from storm water overflows put into effect plan C (except the Rock Creek interceptor) as proposed by the Board of Engineers in its Report to District of Columbia Department of Sanitary Engineering on Improvements to Sewerage System, dated February 28, 1957; and that the construction of these remedial facilities be completed by the end of 1966; and appropriate financial arrangements be made to accomplish this:

7. That the Virginia communities in the Washington metropolitan area will provide treatment commensurate with those provided by the District of Columbia and Maryland political subdivisions;

8. That processes be initiated to define what responsibiilty the Federal Government should have in the program to abate pollution of the Potomac River in the Washington metropolitan area;

9. That the official State water pollution control agencies of the District of Columbia, Maryland, Virginia, and the Interstate Commission on the Potomac River Basin cooperate with each other in the provision and exchange of information on a continuous sampling program of the quality of water of the Potomac River-Washington metropolitan area; and

10. That the Public Health Service will report to the other conferees as to progress at 6-month intervals.

Here is a program for action designed to clean up the Potomac resulting from a conference held under the authority of the Federal Water Pollution Control Act. This is not just another survey or study of what is probably now the Nation's most surveyed and studied river, but definite, positive action proposals designed to do the job in a relatively short time—not stretched over so long a period that by the time it was completed we would have to start all over again.

Up to this time the District of Columbia has not come up with any positive proposals to arrange for the financing of the needed improvements which will reduce pollution from storm water overflows by the end of 1966. The next step is up to the District of Columbia. They must come up with a concrete and reasonable proposal in the near future if this target date is to be met.

I commend the committee on your balanced and constructive approach to this very complex question, and to your recognition early in this study that all aspects of the problem must be dealt with. I sincerely hope you recognize in my remarks the desire to support fully your effort to clean up our national river. Men and

women and children from my congressional district, bus loads of visiting students, come here every year for relaxation, education, and inspiration. They should see their Nation's Capital; they should journey down along the Potomac to Mount Vernon without the disheartening spectacle of a foul and neglected river. As citizens of the Nation, responsible under our Constitution for the Government of the District of Columbia, they have a clear-cut interest and obligation to deal with the metropolitan water problems here. I am confident that the good people in my district and in yours who are given the facts will support the program to clean up the Potomac, which you are considering and which I hope will receive definitive form in your report.

Representative HYDE. Mrs. Wilkins?

Do you mind stating for the reporter your full name and your office, please.

STATEMENT OF ANNE WILKINS, CHAIRMAN OF THE FAIRFAX BOARD OF COUNTY SUPERVISORS

Mrs. WILKINS. Mr. Chairman, I am Anne Wilkins, chairman of the Fairfax Board of County Supervisors.

I am speaking today as an individual member of that board. I have been a member of the Fairfax Board since 1952.

I am a member of the steering committee of the Washington Metropolitan Regional Conference and of the water supply and pollution abatement committee of that conference.

I have been extremely interested in and quite familiar with the sanitation and sewage disposal problems of the Washington metropolitan area—or at least the Virginia part of the area—since Fairfax County embarked upon its ambitious $20 million sewer construction program in 1953.

I believe the most important tasks those of us who are concerned with the problems of Metropolitan Washington have to perform is to bring the Congress of the United States to the realization that the Nation's Capital no longer stops at the boundaries of the District of Columbia and that likewise the Federal responsibility does not end there.

Federal installations and Federal impact in suburban Washington is causing extreme hardship on local suburban communities already hardpressed to provide services to residential subdivisions with little tax-producing business or industry.

Insurmountable financial difficulties are being encountered by the localities in their effort to provide municipal facilities for Federal installations and the satellite communities which inevitably follow.

For example, in Fairfax County we are finding it possible to finance sewer for the CIA installation but have no funds with which to provide additional capacity needed to take care of the growing community which will surround it.

CIA will bring us no taxes with which to pay for the services needed. It will only bring us more people to demand more services. It will, of course, eventually pay off its proportionate share of the sewer debt with services charges but the difficulties come in the initial financing.

It would, of course, be ideal if a trunk sewer could be constructed across country before the subdivisions arrive but as long as we must depend upon revenue bond financing this is not possible.

(Pipe in the ground and "pie in the sky" are not synonomous terms.)

The sewer works cannot be financed until the customers are there.

Customers cannot arrive until some sewer facilities are available. The inevitable result is either a series of unsatisfactory small treatment plants or septic tanks.

This fact of life would exist whether or not the facilities were controlled and administered centrally or by local agencies. The only way this problem can be overcome is by some new method of financing.

The staff study prepared for this committee contains good basic factual data. It is, however, an oversimplification of the situation. This leads to a conclusion which is not justified by the facts. It concludes that centralization is the answer to all problems.

There is no particular merit in bigness itself. In fact in a governmental entity providing peculiarly local services it is especially undesirable because the citizens who require those strictly personal local services lose control.

The only valid justification for a unified sewer system would be either economy or desirability from a pollution abatement standpoint.

As far as economy is concerned, if we assume for the moment that a centralized system is cheaper, the people should have an opportunity to determine whether the economy, if any, so gained outweighs the loss of control. But as for Washington metropolitan area sewers, facts and engineering advice to date do not substantiate a conclusion that a centralized system would be cheaper than one constructed on a watershed basis, which incidentally more properly describes the approach now being used in northern Virginia rather than a jurisdictional basis as described in this study.

From the standpoint of pollution abatement, a centralized system is certainly no panacea. Only the ability to finance the necessary works, whatever the size, can clear up the Potomac River.

All Fairfax County plants will provide a high degree of secondary treatment at completion of present contracts except one, which is intermediate. Fairfax and Alexandria have financed a jointly used large secondary plant.

All this plus the sewer lines themselves have been provided by Fairfax County within 6 years. But our resources now are sorely strained because of the demands of our enormous population growth, which has more than doubled since 1950. We have approximately 208,000 today, and they tell us we can expect at least 3 times that many by 1980.

There will, of course, be justification for gradual combining of some systems as the intervening space becomes built up with customers. Stage construction is the only kind which is practical.

Combining Fairfax County's Pimmit Run system with the District of Columbia system appears to be wise to insure the high standards set for that section of the river as soon as engineering studies indicate that it is economically feasible.

The present planning for that area whcih is now being discussed would include an area entirely up to the Cabin John Bridge.

Combining any future systems above the new water intake at Little Falls probably will be necessary to protect the water supply but, admittedly, extremely expensive.

At the present time, development in this area on both sides of the river is being restricted by zoning.

Perhaps the plants at the central location—Arlington, Alexandria, West Gate, and Blue Plains—will someday be combined, but the Virginia plants are all new (since 1950) and of the most modern design. Abandonment within the foreseeable future not only is unwise and unnecessary but, probably, is impossible under the bond agreements.

The downstream plants and—if you will notice on the map the two red spots at the lower end of Dogue Creek and Little Hunting Creek plants—the difficulties connected with combining those plants and the future system on Pohick Creek with Blue Plains make even the suggestion seem absurd. This area, incidentally, is where Fairfax County's highest density growth can be expected to develop in the years to come.

Clearly, all small private and municipal plants should be abandoned and connected to county trunks as soon as it is possible to do so. The problem from these plants stems solely from the fact we have no control over the local operation.

The State is not adequately staffed to police them, and an ordinance is at present being prepared, with the approval of the Virginia Department of Health, which will give Fairfax County control of the small plants.

Fairfax has taken over and abandoned six of the plants in its present bond program.

The Fairfax town plant and the newest Vienna town plant can eventually be tied into a county system proposed for Accotink Creek watershed. The older Vienna plant could, possibly, be pumped over the ridge at not too great expense, but no plans for this exist at the present time.

Little can be done about the Herndon plant, which, as you will notice, is at the upper right-hand side of the plat, the red circle—little can be done about Herndon plant because of the miles of undeveloped land or estate area between it and existing facilities.

Another plant will be necessary somewhere in this area to take care of the Chantilly Airport. If the CAA cooperates, as its officials have indicated they will, the plant will go on the south side of the ridge instead of in the upper Potomac watershed above the metropolitan area water supply, since water-supply experts have indicated that they consider any additional plants in this area a danger to the water supply, no matter what degree of treatment is provided.

A master plan for sewer for the metropolitan area, developed by joint metropolitan area planning and based on reliable engineering data, would be desirable. This should, of coure, take into consideration investments in existing systems with adequate disposal facilities. It should propose combinations and abandonment of small plants wherever economically feasible.

Construction and operation of systems should continue to be handled by local jurisdiction with joint operations under contract agreements.

The Federal Government should recognize its metropolitan-area responsibility. It certainly should assist in some way in the financing of sewer facilities in areas of heavy Federal impact. If a standard of water quality higher than ordinary is desirable in the Potomac River because this is the Nation's Capital (and most of us agree that it is), this, clearly, is a Federal responsibility.

Until the Federal Government does recognize some responsibility in this field, or until some new method of financing is devised, the needed works probably will continue to be constructed behind time instead of ahead of time, and the Federal City will continue to have its water supply endangered and an open sewer at its door—as much as all of us would like to prevent it—whether there is a combined sewer system or independent systems on a watershed basis.

On the subject of siltation and watershed management, I would like to urge a review of the present watershed-protection laws as suggested by Mr. Frank, in his paper, with a view to their revision to better handle the urban problem. We have encountered considerable difficulty in Fairfax in this regard.

As far as water supply is concerned, the situation in Fairfax is too chaotic at the moment for me to be in a position to comment at this length.

For 6 years we have struggled with the problem of providing a county water system, still without success. I would, however, like to ask your assistance in one regard.

It surely was not the intent of Congress, when it granted permission for local authorities to purchase water from Dalecarlia, that a municipality should buy such water at cost and resell it to customers outside its jurisdiction at a profit to the municipality.

At the same time, this particular municipality which is doing this is in a position to grab the customers quckly and thereby thwart Fairfax County's efforts to provide its own system which is needed as well in some of the less densely populated area.

Legislative clarification of this situation would be extremely helpful to at least one large segment of the metropolitan area.

Thank you, Mr. Chairman.

Representative HYDE. Thank you, Mrs. Wilkins.

We will be glad to give whatever help we can properly give to any problem you have there.

Would you care to have a Marylander state the name of this recalcitrant municipality?

Mrs. WILKINS. The city of Falls Church.

Representative HYDE. Mrs. Wilkins, on this matter of financing, the need for Federal assistance, in the reports there are statements to the effect that some of the treatment plants, because of their size and because of the small number of people they serve, cost a great deal more on a per capita basis than they do in other jurisdictions.

Have you people looked into that statement in the reports to the extent that you can confirm or deny that observation?

Mrs. WILKINS. I think that this undoubtedly is true, if you compare the small one-unit plants that are operated privately or by some of the municipalities in Virginia. I do not think the engineering data that we have substantiates that when you compare the county-operated plants, which are somewhat larger, with the extremely large, 1 or 2 extremely large plants in the area.

For instance, Mr. Corbalis is here from Alexandria, and he can give you some of the details of it, but I doubt if there is any appreciable difference in the operation of the Alexandria——

Representative HYDE. Not the operation, but construction costs insofar as the per capita cost.

Mrs. WILKINS. All the engineering data we have indicates that it has been less expensive to construct the plants on a watershed basis than to combine them at one point, and that——

Representative HYDE. That leads me to the question of trying to help out, and if an operation is obviously uneconomical or less economical, let us say, in one part of the region than in the other, there is going to be some difficulty in getting Federal funds for an uneconomical operation, would you not think?

Mrs. WILKINS. I think you are quite right, and I am sure I would be the first to agree that if one central plant is more economical, this is the way we should handle it.

But the engineering data I have seen to date does not substantiate that.

Representative HYDE. Thank you, Mrs. Wilkins.

Are there any questions?

(No response.)

Representative HYDE. Thank you very much, Mrs. Wilkins. We appreciate very much your coming here to give us the benefit of your testimony.

Our next witness is Mr. Robinson. Will you state your name and affiliation for the record, please?

STATEMENT OF C. C. ROBINSON, DIRECTOR, NORTHERN VIRGINIA REGIONAL PLANNING AND ECONOMIC DEVELOPMENT COMMISSION

Mr. ROBINSON. Mr. Hyde, my name is Charles C. Robinson, and I am director of the Northern Virginia Regional Planning and Economic Development Commission.

Representative HYDE. Excuse me a moment.

I might say, because of the press of time——

Mr. ROBINSON. This is very short.

Representative HYDE. Mr. Robinson will be the last witness we will be able to hear—we will hear from one more witness after you, Mr. Robinson.

You may proceed.

Mr. ROBINSON. Our commission is responsible for regional planning for the portion of northern Virginia from Harpers Ferry to Quantico, so we naturally have a very lively interest in this problem of water.

We in northern Virginia are very much interested and intrigued by some of the proposals advanced in your staff studies, particularly those having to do with supplying water to the Washington metropolitan area.

The Northern Virginia Regional Planning and Economic Development Commission has had indications in the last day or so that at least several of its constituent counties and cities expect to ask the commission to study and evaluate the recommendations made by your consultants.

I believe that none of the six counties and cities making up the northern Virginia region has had an opportunity, due to limitation of time, to have a hard look at Mr. Levin's proposals in order to see what effect and impact these proposals, if implemented by legislation, might have on existing water supply and distribution systems.

Since, as seems probable, the northern Virginia commission will be requested to make a study of Mr. Levin's report and make recommendations to its local jurisdictions, we would appreciate very much your committee's holding open the record so that the commission and the local governing bodies may have an opportunity to testify on or to register reactions to this report before the deliberations of the Joint Committee on Washington Metropolitan Problems are completed and the committee's conclusions are offered to the Congress.

Representative HYDE. Within what time?

Mr. ROBINSON. I would hope within a month or a month and a half. That would be time——

Representative HYDE. I should think the record could be held open for your observations.

Mr. GUTHEIM. It is possible, Mr. Robinson, that the study that we contemplate might be assisted if you would have at your disposal not only Mr. Levin's report but the record of these hearings as they are now being conducted.

Mr. ROBINSON. They would be very helpful.

Mr. GUTHEIM. In view of the fact that it is a committee which is engaging in a continuing study which is leading to a report next January, I would certainly think there would be time for a very productive relationship along the lines you have indicated.

Mr. ROBINSON. We would hope very much to take advantage of Mr. Levin by asking him to sit in at some point.

Representative HYDE. Thank you very much, Mr. Robinson. We appreciate very much your giving us the benefit of your testimony.

(Off the record.)

Representative HYDE. All right, thank you very much gentlemen.

The committee will stand adjourned, then, until 9:30 tomorrow morning.

(Whereupon, at 4:20 p. m., the subcommittee adjourned, to reconvene at 9:30 a. m., of the following day, Wednesday, April 23, 1958.)

WASHINGTON METROPOLITAN AREA WATER PROBLEMS

WEDNESDAY, APRIL 23, 1958

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS,
Washington, D. C.

The joint committee met, pursuant to recess, at 9:30 a. m., in room P-38, United States Capitol Building, Washington, Representative DeWitt Hyde (vice chairman) presiding.

Present: Senators Bible, Morse and Representative Hyde.

Also present: Frederick Gutheim, staff director; Betty Kraus, secretary; and Gilbert V. Levin, special consultant.

Representative HYDE. The committee will come to order.

I want to say at the start, for the benefit of witnesses who may appear this morning, that I found yesterday's testimony very interesting in several respects. I may change my mind after I have had an opportunity to read the transcript in more detail. But so far it appears to me that particularly with respect to local officials who have testified, that the one solution of the water problem, using the water problem in its broadest sense, is money. Well of course there is nothing new about that. That is the solution, of course, for domestic relations problems, educational problems, law enforcement, world peace, and everything else. And if that is the solution, then our job at arriving at the solution is comparatively simple. Of course, the execution of that solution is not so simple.

We are going to have to think of some good, pertinent reasons why this money solution should come from the Federal Government, which of course is always the source. I could think of several reasons, have used them, and will use them today, this afternoon on the floor of the House when we are discussing the impacted area program. But it is becoming increasingly difficult to convince, for example, the people in Garrett County, in my district, where the per capita income is a little more than $900 a year, why these should help pay for the sewer and water, in addition to the schools, of communities such as Montgomery and Arlington Counties where the per capita income is much higher.

As I say, I can think of arguments, and have used them on the floor of the House. But it is becoming a little more difficult to convince the people of the country that they should put up their tax money to help local communities in the Washington area, when, as I say, their per capita incomes are so much higher.

There are some arguments for it. But if there is the only solution, the only thing I want to direct toward the witnesses today who may testify on the subject is a plea to give us as much help as possible in

telling us, as far as the arguments that we are going to have to use are concerned, in order to put this solution into effect.

If it is not the only solution, the committee would like some help from the witnesses on what other solutions there may be to the problem.

Now, our first witness this morning is Mr. Robinson, Mr. Charles A. Robinson.

Mr. NUTTLE. I might say, Congressman, that one of my friends here was rather embarrassed that I called you Senator a while ago. Well, our acquaintance began when you were one of the ablest senators over in Annapolis, so that was the background of my greeting.

Representative HYDE. Thank you, Mr. Nuttle, I don't mind being increased in rank once in a while.

Mr. Robinson, will you give your name?

STATEMENT OF CHARLES A. ROBINSON, JR., STAFF ENGINEER, NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

Mr. ROBINSON. Mr. Chairman, and gentlemen of the committee, my name is Charles A. Robinson, Jr. I am a staff engineer of the National Rural Electric Cooperative Association. I have with me here Mr. Harry Nuttle, who is the director, our national director from the State of Maryland.

Mr. Nuttle has been a director of our organization for more than 10 years, longer than I have been affiliated with it, and we consider him one of the most able members of our board.

I would like, if it is agreeable with the Chair, to just refer briefly to my prepared statement, copies of which I gave to the clerk, and then yield the preponderance of our time to Mr. Nuttle, because of his close relationship with the problems that exist in the field on this matter.

Representative HYDE. All right.

Mr. ROBINSON. Mr. Chairman, the position of the National Rural Electric Cooperative Association with respect to development of the Potomac River has been advocated extensively upon prior occasions during hearings conducted by other committees of the Congress, and during hearings held by the Washington district engineer pursuant to review of plans for Potomac River development being undertaken by the Corps of Engineers at the present time. And, because this committee is not, at this time, considering legislative proposals, there appears no need to resubmit our position at length during these hearings.

We, therefore, limit our presentation to just outlining the following elements of the position we have previously advocated and which we still advocate at this time.

Representative HYDE. Mr. Robinson, you appreciate this committee is considering the water problem from the standpoint of the Washington metropolitan area?

Mr. ROBINSON. Yes, sir.

Representative HYDE. All right.

Mr. ROBINSON. (1) The need for developing the Potomac River is urgent and immediate if the water supply, sewage disposal, flood control, and recreational benefits potentially available from the river are to be realized and preserved for the rapidly increasing popula-

tion of the District of Columbia and its surrounding metropolitan area in time to avert a very real water shortage and health hazard.

(2) Because the Congress has reserved to itself the local legislative power in the District of Columbia, and because the Potomac River is an interstate stream, development of which is virtually indispensable to the public health of the citizens of the District of Columbia, there rests upon the Congress a correlative responsibility to supply the initiative, leadership, authority, financing, and procedural form with which to develop the Potomac River.

(3) Most of the professional technical reports submitted during the past dozen years pursuant to various studies designed to determine what type of development would best satisfy the water-resource needs of the District of Columbia metropolitan area have expressly, or by implication, recognized the need for including substantial reservoir storage capacity in any acceptable plan for river development. Most of these reports recognize the advantages of constructing River Bend Dam and Reservoir.

(4) The government of the District of Columbia, through a statement by its Board of Commissioners submitted to the Washington district engineer on June 26, 1957, has expressed unequivocal support for construction of major reservoir-storage facilities, including River Bend Dam.

(5) Our contention, in capsule form, Mr. Chairman, is that major reservoir storage facilities are most economically provided on a multiple-purpose basis and should include self-liquidating features for the incidental generation of hydroelectric power during times of reservoir releases.

Our people are most anxious to purchase such power as is generated at the storage projects, if and when they are built on the Potomac River.

And I might say, Mr. Chairman, in reference to your initial remarks this morning, that the power features would not only pay for themselves, but would probably substantially subsidize the other features of the project. This would probably be one argument for increasing power and argument to our people back home that although the Federal Government might be called upon initially to finance the project, certainly the power features would be self-liquidating and would, at least to some extent, subsidize other features.

There is also the consideration in financing the project that sewage disposal and municipal water supply facilities throughout the country are generally self-liquidating. In other words, in my own community of Vienna, Va., for instance, we are almost constantly floating water and sewage bonds. These bonds, of course, bear various rates of interest. And the money is obtained in the commercial money market. Certainly the moneylenders in the commercial market would not be willing to risk their capital on water and sewage facilities unless they thought they were going to get it back in a normal period of years.

So although the responsibility of the Federal Government to provide initial facilities for the Washington area for sewage and water facilities from the Potomac River might require an extensive outlay of money, certainly most of that should be recouped within a 40- to 50-year period, I would think.

Representative HYDE. They can be recouped, as I understand it, from water revenues.

Mr. ROBINSON. I think it should be recouped from several sources. Of course, there would be water revenues. Certainly there are revenues for use of the sewage system; that is, as far as the sanitary sewers go. And you would recoup—if hydroelectric power is installed, which we hope it would be, you would recoup from the sale of that, not only enough to pay for the power features themselves, but certainly much more. That has been the experience throughout the country.

For instance, the upper Colorado project, which the Congress authorized a year or so ago—irrigation is a very substantial purpose of that project. Yet naturally all of the cost of the project allocated to irrigation will be repaid by the revenue that will accrue from power sales. This is the general experience.

The same is true with the Missouri Basin project. Any multiple-purpose project that includes power, under those circumstances—all of the other reimbursable features look to power for subsidization.

Representative HYDE. You mean the entire capital expenditure is going to be paid out of revenues from hydroelectric power?

Mr. ROBINSON. I won't say the entire, because there are some non-reimbursable features, such as flood control, which has been a non-reimbursable feature of such projects. But the great preponderance of the irrigation allocation will be paid from power revenue. So that if power were included in these projects on the Potomac River, and properly marketed, there is no reason why the income from the power features should not substantially subsidize sewage disposal, water supply, and what other purposes were included.

There is of course also the possibility of making recreation a reimbursable feature. If you can conceive of limiting access to the recreational areas someway, which might be extremely difficult—certainly some portions of the recreational opportunities could be reimbursable.

Representative HYDE. Well, Mr. Robinson, do you think if we find a dam of X size is sufficient for water purposes, we should nevertheless build it to X plus Y in order to provide hydroelectric power?

Mr. ROBINSON. I would say as a general rule, "yes, sir." But I think inherent in that answer is the assumption that the power features would pay for themselves and would also pay for other features, help to pay for other features.

Representative HYDE. Those of you that advocated hydroelectric power, have you considered the effect of atomic energy, whether or not that will make hydroelectric power obsolete?

Mr. ROBINSON. Yes, sir; we have considered at some length the impact of atomic energy on the economy, and on the electric power business. But atomic energy and thermal or heat energy produced from conventional fuels, as it is at the present time, have a lot in common. Atomic energy, like stream-produced energy, is a base load operation. The initial cost of atomic energy plant is extremely high.

Representative HYDE. So is the initial cost of a hydroelectric dam.

Mr. ROBINSON. Yes, sir. But in operating an atomic energy plant, like a conventional fuel plant, you should operate it at a high-load factor to take advantage of the low-fuel costs. In other words, you

want as continuous an operation as you can get out of any fuel-fired or atomic-energy-fired plant. Now, a hydroelectric plant is ideally suited to peaking purposes, and to the extent that you can get peaking power from a hydroelectric plant, it precludes the necessity of building an atomic plant, we will say, or a fuel-fired plant, to carry that peak load, and also precludes the necessity for having this fuel-fired plant that is carrying peak loads stand idle during the rest of the day, thereby tremendously increasing its units cost of operation.

Representative HYDE. I have heard that argument many times, Mr. Robinson, but I have to say it leaves me cold, particularly in view of the fact that you have a project like your TVA project, which is now about 70 percent steam-generated, and bids fair to be more. Hydro power, it seems to me, is all right where conventional fuels are not available, or where you have to build a project of a certain size for adequate water storage, and then to have your hydro as an added use, and to make the project more economical, yes, I can see it. But hydro power just for the sake of hydro power, just because you have a river there, you will never convince me as to its being economical or more efficient. It is not more efficient, of course, because you have to have steam power to stand by for hydro power.

So I would be all for your hydro suggestion if it is necessary to build a dam of such height that it would then also be usable for hydro power. But I think the question of water need is the first question, not that of hydro power.

Mr. ROBINSON. Mr. Chairman, I think you are absolutely right. That is exactly our position. The principal problems are water supply and sewage disposal. There is no question about it. All we are suggesting is that these can be attained by—a more economical basis by the inclusion of hydroelectric power, and if the Corps of Engineers comes up with that finding, as we think they would have to, we simply want to be placed on record supporting the inclusion of hydroelectric power.

Now, I certainly think that the chairman is entitled to his view on the value of hydroelectric power, but I think there is probably a good deal of opinion on both sides of that question. The private utility companies are certainly developing hydroelectric power where they have no steam, and the——

Representative HYDE. I am not saying, Mr. Robinson, hydro power has no use. But I think it has limitations.

Mr. ROBINSON. Yes, sir. I think all individual sources of energy have their limitations. I think that is right.

Representative HYDE. I haven't seen any limitations on conventional fuel where you have plenty of it.

Mr. ROBINSON. No, sir; except that you can put hydro or a conventional fuel-fired system—you can save a lot of money in operating it.

Representative HYDE. If you can show that to us, I would be interested.

Mr. ROBINSON. Mr. Chairman, unless there are further questions, I would like at this time to yield to Mr. Nuttle to present a statement.

(The full statement of Mr. Robinson is as follows:)

"TOO THICK TO DRINK AND TOO THIN TO CULTIVATE"

Statement of National Rural Electric Cooperative Association in support of multiple purpose development of the Potomac River

Mr. Chairman and gentlemen of the committee, my name is Charles A. Robinson, Jr. I am the staff engineer of the National Rural Electric Cooperative Association which is the national service organization of REA-financed rural electric systems throughout the United States and Alaska. There are, in all, 1,080 REA-financed rural electric systems throughout the United States which serve some 2,600 counties in 45 States—in every State except Connecticut, Massachusetts, and Rhode Island.

During the week of April 10, 1958, about 10 days ago, REA approved loan funds to provide service to the 5 millionth rural, electric system consumer. Within the next few months, therefore, REA-financed rural electric systems will be serving 5 million meters and a correspondingly larger number of persons in the rural sections of the Nation.

During the fiscal year ended June 30, 1957, the 1,080 rural electric systems used 21.6 billion kilowatt-hours of wholesale electric energy. Of this, only about 16.2 percent was generated by the rural electric systems themselves. Private electric utility companies supplied about 39.8 percent of all energy used by the rural electric systems, and 7.4 percent was purchased from municipalities, State government utilities, and other non-Federal public agencies. The Federal power marketing agencies—such agencies as the Tennessee Valley Authority, the Bureau of Reclamation, the Bonneville Power Administration, the Southeastern Power Administration, and the Southwestern Power Administration—supplied the remaining 36.6 percent of the wholesale energy used by the rural electric systems during the fiscal year 1957. Approximately 450, or nearly one-half of all the rural electric systems throughout the country purchase from these Federal power marketing agencies all or a portion of their wholesale power requirements.

Because of this relationship between Federal power and the rural electrification program, the traditional position of this association has been in support of multiple-purpose river basin development by the Federal Government where such Federal development will achieve substantially greater overall benefits than will private development, where such Federal development is economically justified, and where such Federal development will provide substantial quantities of wholesale electric energy for our membership.

During the 1958 annual meeting of the National Rural Electric Cooperative Association which was attended by some 6,000 delegates at Dallas, Tex., last February, our people adopted a resolution expressly advocating authorization by the Congress of multiple-purpose development of the Potomac River, as well as other rivers throughout the country. A copy of that resolution follows this statement.

Mr. Chairman, the position of the National Rural Electric Cooperative Association, with respect to development of the Potomac River, has been advocated extensively upon prior occasions during hearings conducted by other committees of the Congress, and during hearings held by the Washington district engineer pursuant to review of plans for Potomac River development being undertaken by the Corps of Engineers at the present time. And, because this committee is not, at this time, considering legislative proposals, there appears no need to resubmit our position at length during these hearings. We, therefore, limit our presentation to just outlining the following elements of the position we have previously advocated and which we still advocate at this time.

I. The need for developing the Potomac River is urgent and immediate if the water supply, sewage disposal, flood control, and recreational benefits potentially available from the river are to be realized and preserved for the rapidly increasing population of the District of Columbia and its surrounding metropolitan area in time to avert a very real water shortage and health hazard.

II. Because the Congress has reserved to itself the local legislative power in the District of Columbia, and because the Potomac River is an interstate stream, development of which is virtually indispensable to the public health of the citizens of the District of Columbia, there rests upon the Congress a correlative responsibility to supply the initiative, leadership, authority financing, and procedural forum with which to develop the Potomac River.

III. Most of the professional technical reports submitted during the past dozen years pursuant to various studies designed to determine what type of development would best satisfy the water resource needs of the District of Columbia metropolitan area have expressly, or by implication, recognized the need for including substantial reservoir storage capacity in any acceptable plan for river development. Most of these reports recognize the advantages of constructing River Bend Dam and Reservoir.

IV. The government of the District of Columbia, through a statement by its Board of Commissioners submitted to the Washington district engineer on June 26, 1957, has expressed unequivocal support for construction of major reservoir storage facilities, including River Bend Dam.

V. Our contention, in capsule form, is, Mr. Chairman, that major reservoir storage facilities are most economically provided on a multiple-purpose basis and should include self-liquidating features for the incidental generation of hydroelectric power during times of reservoir releases.

We are aware that the Potomac Electric Power Co. which furnishes electric-utility service to the District of Columbia and suburban Maryland areas, through its engineer, Mr. L. W. Cadwallader, expressed opposition to construction of large storage reservoirs on the river during a hearing held on December 4, 1956, by a special Maryland legislative committee on the Potomac. It appears reasonable to infer from the opposition of the company that it believes undesirable the incidental production of hydroelectric power from Potomac River reservoir storage facilities designed to afford water supply and sewage disposal relief to the metroplitan areas. It appears but slightly less reasonable to infer that the company does not, therefore, wish to purchase such power if it were generated.

We can only say, Mr. Chairman in this regard, that the company speaks for itself. Allow us to add, however, that if such power is generated, the rural-electric systems in the surrounding area will be happy to purchase all of it, or all of it that is made available to them and they will use it to reduce retail rates to the rural consumers which they serve.

Mr. Harry Nuttle, a member of our national board of directors from the State of Maryland is scheduled to testify on this matter following my presentation. He will acquaint you with the views of the individual cooperatives in the Potomac watershed and adjacent areas concerning this matter, and lay before you the reasons why our people in the mid-Atlantic State area are so interested in the Potomac River.

It has, as always, been a privilege to appear, and we thank you for again offering us the opportunity to present our views.

RESOLUTION ADOPTED BY 1958 ANNUAL MEETING, NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

From: Power and Generation Committee.
Approved by: Resolutions Committee.
Subject: Completion schedules of authorized projects.

Whereas the demands for increased power supply to meet the growing needs of the electric consumers of the rural electric systems throughout the country must be met on time; and

Whereas the power supply to meet the demands of the consumers must be provided at the most economical rate in order to insure the most widespread use by the farmers and rural industries to improve the economic conditions which are vital to the development of the rural areas and to help win peace for the world; and

Whereas the multipurpose projects already authorized by the Congress and new projects which are feasible will, when completed, meet, in part, the increasing demands for power: Now, therefore, be it

Resolved, That the Congress be urged to take immediate action to assure the completion at the earliest possible date of the following projects which have heretofore been authorized by the Congress:

Fort Gaines lock and dam, Alabama, Georgia.
Hartwell Reservoir, Ga.
Barkley Dam, Ky., Tenn.
Table Rock Reservoir, Mo., Ark.
Fort Peck Dam, Mont. (second powerhouse).

Garrison Reservoir, N. Dak.
Cougar Reservoir, Oreg.
Hills Creek Reservoir, Oreg.
The Dalles lock and dam, Oregon, Washington.
Oahe Reservoir, S. Dak.
Ice Harbor lock and dam, Washington.
Bull Shoals Reservoir, Ark., Mo.
Dardanelle lock and dam, Arkansas.
Greers Ferry Reservoir, Ark.
Eufaula Reservoir, Okla.
Cheatham lock and dam, Tennessee.
McGee Bend Dam, Tex.
Chief Joseph Dam, Wash.
John Day Dam, Oreg., Wash.

and be it further

Resolved, That the Congress provide adequate funds to expeditiously develop appropriate designs and plans for construction of the following authorized projects:

Beaver Reservoir, Ark.
Green Peter Reservoir, Oreg.
Big Bend Reservoir, S. Dak.
Lower Monumental Reservoir, Wash.
Millers Ferry, Ala.
Jones Bluff, Ala.

and be it further

Resolved, That the Congress take immediate steps to authorize the following projects for construction and operation by the Federal Government in accordance with the principles embodied in the Flood Control Act of 1944; and provide funds for the construction of same without delay:

Fryingpan, Ark., Colo.
Paradise, Mont.
Trinity, Calif.
Little River, Okla.
Lone Rock, Ark.
Gilbert, Ark.
Potomac River (including River Bend Reservoir).
Hells Canyon, Idaho, Oreg.
San Juan, Chama, N. Mex.
Navajo, N. Mex.

and be it further

Resolved, That the attention of the Congress be respectfully called to the fact that the commitment of funds called for by this resolution constitutes, rather than an expense, a prudent and relatively small investment in the conservation and development of natural resources. The projects for which funds are asked will serve the needs of the Nation for water conservation, navigation, irrigation, hydroelectric power, and the other benefits customarily attributable to multiple-purpose river-basin development, and will simultaneously repay their entire costs.

Representative HYDE. We would be glad to hear from Mr. Nuttle. Mr. Nuttle, will you state your full name?

STATEMENT OF HARRY H. NUTTLE, NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

Mr. NUTTLE. My name is Harry H. Nuttle, of Denton, Caroline County, Md.

I represent the REA co-ops within a distance of 100 miles, I would say, of the proposed dam.

Maybe I had better give you a little of my background. I live in Denton. I am engaged in farming, canning tomatoes, banking, and public service to the people in my community.

I will read this statement. You all have a copy of it, I think, that you can follow.

I am a member of the board of regents, Maryland University, and have served in both the house of delegates and the senate of our general assembly. I now serve on the central board of directors of the Southern States Cooperative, and the national board of directors of the National Rural Electric Cooperative Association, representing the electric cooperatives in Maryland. I have been secretary-treasurer of the Choptank Electric Cooperative, with headquarters in Denton, since the co-op was organized in 1937. We serve 12,000 members in nine counties of the Eastern Shore.

To further conserve the time of this committee, I have been asked to also represent here today the several electric cooperatives in Virginia and Pennsylvania. Together we serve approximately 100,000 members who could benefit considerably from full development of the resources of the Potomac River.

Recently I read a couple of short quotations from one of the great Senators of all time, Senator George Norris of Nebraska, and I would like to put them into the record at this point:

> Every stream in the United States which flows from the mountains through the meadows to the sea has the possibility of producing electricity for cheap power and cheap lighting, to be carried into the homes and businesses and industry of the American people.

And another time, while talking about the Potomac River, he pointed out that—

> It is a moral sin that within the shadow of the dome of the Capitol one of the greatest waterpower possibilities is being wasted while we investigate and investigate.

More than 30 years later we are still investigating.

The announced purpose of these hearings was limited to consideration of certain reports to the committee on water supply, water pollution, conservation, and recreation in the Washington metropolitan area. During the short time these reports have been available to us, we have read them with great interest. We were convinced before, and are more certain now, that we have a responsibility to take an active interest in any phase of Potomac River development. It is true that we are primarily interested in Potomac River development to secure the large potential of low-cost electric power it is capable of producing, and therefore to relieve us from the pressure of high electric rates and secure an additional supply of power.

Such relief would enable our farmer members to make the widest and most efficient use of electric energy at a time when electric power is becoming a sizable part of their expense. I wish I could take the time to tell you of the dramatic manner in which many of our progressive Eastern Shore farmers are using electricity.

For example, Brooks Nagel, one of our members who lives in Caroline County, has a large dairy farm, paying more than a hundred dollars a month for electric power. The cows are milked with electric milking machines. The milk goes from the cow to your front doorstep here in Washington without ever being exposed to the air. The milk is pumped from the milking machines into a large refrigerated tank where it is collected by Lucerne Dairy by being pumped into a large tank truck. Each of these operations are dependent on electric power

as are 400 other known uses in the farm home and on the farmstead such as running water, elevators, feed grinders, hay dryers, heat lamps, and irrigation pumps.

We are here today because we feel, first, that one or more phases of Potomac River development cannot be considered without cutting across all phases of multiple-purpose river-basin development, and, second, we feel that inclusion of hydroelectric facilities is necessary to economic feasibility.

Also, we believe there are certain parts of the staff's reports on which we should express an opinion and give recommendations. Incidentally, we commend the committee for securing the services of a person so well qualified to analyze the subject of water supply and pollution. It seems to us that Mr. Levin's formal training at Johns Hopkins University and his experience in several related fields, eminently qualify him as an authority on these problems.

It is our opinion, failure to approach the Potomac River problem on a multiple-purpose basis will impair the future growth of this part of our country. We wish to point out that regulation of the flow of water is not usually done for water supply alone. In this case, water supply is the dominant need, but not the only one.

As Mr. Robinson has indicated, we must develop our water resources in the public interest. We believe, along with many others, that water needs can be fulfilled most economically through multiple-purpose storage reservoirs which are coordinated for maximum use of water.

It seems to us Mr. Levin demonstrates that the Potomac River must be impounded to conserve every drop of water that can possibly be made available, as many other authorities have done in recent years. The immediate future needs of this rapidly expanding area put us in the position where it is no longer a question of upstream or downstream engineering—we must have both.

We also believe that the Federal Government cannot and should not avoid the responsibility of the municipal water-supply needs of the Nation's Capital, including the entire metropolitan area, on a reimbursable basis by those who are served, of course.

To postpone its responsibility will result in much higher costs later on. It seems clear to us that the demands on water supply in this area dictate that the Federal Government must step in as soon as possible and fully develop the Potomac River. This recommendation is in conformity with the multiple-purpose concept and unified development approach established by former President Theodore Roosevelt, whose 100th birthday anniversary we celebrate this year.

We appear here in full support of the comprehensive development of the Potomac River by the Corps of Engineers at the earliest possible time. We believe it is beyond the scope and ability of any other agency to fully develop the river's rich resources, and we urge this committee to recommend that the Corps of Engineers be given adequate funds to complete its current study at the earliest possible time, so that the needs of the area can be met in time to avoid jeopardy to the future water supply.

We also feel that carrying out the corps' plans is a Federal responsibility and one that can only be done promptly and efficiently by something more than an interstate organization. Experience in this country has proven that multipurpose river development simply cannot be

done by interstate compact—at least it has not been done. Our neighbors in Delaware, Pennsylvania, New Jersey, and New York tried it several years ago on the Delaware River with an interstate organization commonly known as Incodel, and finally ended up recommending the Federal Government do the job after years of useless arguing with no results. We recommend a Federal Interagency Committee with State representation such as has been done in the Columbia River Basin.

Representative HYDE. You are talking about physical development there?

Mr. NUTTLE. That is right.

Representative HYDE. All right.

Mr. NUTTLE. We also want to point out to the committee that very few cities have the opportunity for water resources and development as close by as Washington does. Most other cities must go many miles away, and to great expense, to build conduits for water and transmission lines for electricity, burdening its citizens with additional tax expense. Here we have a source of supply of water literally in our own front yard, available at minimum costs to the citizens in the area. Revenue from water supply and low-cost electric power would help considerably to bring about pollution abatement, flood control, and the type of recreation facilities which would benefit the greatest number.

We have been very much concerned about information presented to the public by others, about the interests of the electric cooperatives in Potomac River development. It has been said that the number of people affected is small, the amount of electricity which would be available from hydroelectric facilities is small, that hydroelectric installations would be obsolete in the near future, and that the commercial power companies in the area will be able to take care of our future needs.

Of course, this sounds very much like the information that was passed out in the middle thirties, when it was claimed that the 10 percent of farms in this country then receiving electric service was all that would use enough to make it economically worthwhile. Less than 10 percent of our Eastern Shore farmers had electric service and in most cases even those few had to pay for the line in order to secure the service.

Today, about 95 percent of our farms have the wonderful benefits of electricity, but in this area at least it is available at a very high cost. Also, farmers are doubling their use of electricity every 5 to 7 years, and we are concerned about future supply as well as continuous rising costs.

Let me briefly answer the false information referred to above. Our numbers are not small. The Choptank Electric Cooperative has 12,000 members. Our neighbor in Delaware has 10,000 members. The cooperative in Southern Maryland will soon be 1 of the 3 largest electric cooperatives in the United States with about 25,000 members.

At least 5 cooperatives across the Potomac River in Virginia have about 26,000 members, and another 5 in southern Pennsylvania with over 28,000 members. At the national average of 4 to a family, this means approximately 400,000 people interested in low-cost and adequate electric power for the future. I would like to introduce into

the record a simply drawn map of the area, which shows the location of these electric cooperatives and the number of members affected; also, the dam sites proposed in the 1944 report of the Corps of Engineers.

Incidentally, millions of other people would also benefit, for the introduction of low-cost hydro power in various areas of this country has proven that the competitive influence of such power forces down electric rates to urban and rural people alike.

It is interesting to compare the influence on retail electric rates of even a threat to hydro development by the Federal Government, or construction of a generating plant by electric co-ops. We have two good examples in this area. Several years ago the 16 electric co-ops in Virginia paid about 11 mills for wholesale electric power.

Today, although electric rates of most utilities have been going up in recent years, the Virginia co-ops are paying less than 7 mills for power from the John Kerr Dam on the Roanoke River and about 8 mills for power purchased from the power companies.

In the early twenties, Senator Norris tried in vain to get the Potomac River developed, but his efforts did bring the sliding scale rate adjustment plan to Washington, which resulted in comparatively low rates for this area. I would like to put in the record at this point a comparison of the rates in Baltimore and Washington for each year, beginning with 1924: And there below in my statement you see a list of the rates. You notice that the Baltimore rate runs from $3 million down to $1, and now it is about $1.43 difference between the Baltimore and Washington rate.

Representative HYDE. Mr. Nuttle, those figures do not prove the same thing to me as to you. They prove to me you can have low rates with proper regulation without competing hydro power.

Mr. NUTTLE. Well, I believe this started because of the threat of the dam on the Potomac with Senator Norris in the twenties. It started right after 1924—you can see those rates. And I have understood—I am not an engineer or anything, but I have understood that the threat—they agreed above their costs to return the rates to those users in the Washington area.

Representative HYDE. Who agreed to that—the power company?

Mr. NUTTLE. The power company and I don't know who the other is—the Public Service Commission in Washington, you had something like this.

Representative HYDE. The rates don't depend on what they agreed to.

Mr. NUTTLE. Well, there was an agreement of some sort.

Representative HYDE. Yes, but they are told by the Public Service Commission what they can charge. It is not a contract.

Mr. NUTTLE. They agreed in 1924 to reduce their rates to the public above their actual costs—they would reduce some—and that is the result of the difference, I would think.

Representative HYDE. All right.

Mr. NUTTLE. That is just my opinion.

Here are two cities that should have about the same rates, but it is interesting to note the sharper decline in one than the other. The rates of both cities began to increase and have climbed at about the same rate since. This situation should concern everyone in this area, when we have at our doorstep the great hydroelectric potential of the Potomac River.

A Potomac Electric Power Co. representative told a Maryland legislative committee that his company was not interested in hydroelectric power from the Potomac River. We are interested in such power, and we know why they are not interested, at least we are guessing, although we feel they should be. Adequate water supply is needed for their generating plants and more will be needed in the future. Also, they should be able to use hydro power for peaking and standby at a handsome profit.

According to the Corps of Engineers' report of 1944, the Potomac River fully developed, has hydro capacity of 694,000 kilowatts, with an annual output of 2.3 billion kilowatt-hours. Experts in the business believe such a great quantity of power could be produced at less than 8 mills, including reasonable delivery.

On the Eastern Shore we are now buying more than 40 million kilowatt-hours at a little less than 13 mills. The Delaware Co-op is paying the same rate. A saving of even 1 mill means more than $40,000 a year to our co-op members. Our friends in southern Maryland are paying about 10 mills. Of course the power companies will take care of our needs as long as they can charge such rates. A report in the annual statistical issue of Electrical World issued January 27, 1958, indicates that more rate increases can be anticipated in the future.

Representative HYDE. Are the rates subject to regulation by the Public Service Commission?

Mr. NUTTLE. Yes, sir.

Representative HYDE. Do you think the power company charges you too much?

Mr. NUTTLE. They say they are in trouble. We are trying to negotiate a new contract now.

Representative HYDE. Do you think they are charging you too much?

Mr. NUTTLE. Just speaking frankly, as a farmer, I think there is some hidden costs in there somewhere that are not shown. I don't know. I can't understand why the national average is 8 mills and why we have to pay 13. Approximately 13—12½ to 13. That is my personal feeling.

Representative HYDE. Thank you.

Mr. Nuttle, we will submit your statement in full, but in the interests of time, is there any part you could highlight?

Mr. NUTTLE. There is not a lot of information here. I understand the committee—there is one phase that I would—and I don't know that I know enough about it to say much about it. But the emphasis has been on the Interstate Commission that has been set up for years. And they hired Abel Wolman to write a report, which came out this last year. And they had a meeting in Richmond recently, and they never discussed the Wolman report. And we have seen the agenda for the next meeting, and they have never discussed that. That is not on the agenda. It may be brought up.

Frankly, I don't see how these interstate agencies, with their divided loyalties and so on—I don't see how they are ever going to get anywhere. And personally, I would like to see the Federal Government step in, the local people pay most of the bills, and get some action on this thing.

Representative HYDE. You would like to see the Federal Government construct, regulate, and control, plan, and recommend. Is that it?

Mr. NUTTLE. I would like to see an authority set up to move into the picture, sir, in some way.

Representative HYDE. For the whole river basin?

Mr. NUTTLE. Well, I think if they get the dam, they should maybe turn it over to the local people for the sale of—you know, handle it locally. I don't want to disrupt this.

Representative HYDE. You mean that your observation is they are not handling it properly now on a cooperative basis?

Mr. NUTTLE. I think they are handling them in a little way, maybe on a cooperative basis. But this big picture and the future of the city of Washington with prospective growth is such that unless action is done a little, more motions gotten into the picture than has happened recently, I don't think we are going to meet our problems.

Representative HYDE. You would not agree with our witnesses of yesterday that all that is needed is not more comprehensive regulation, control, and planning, but simply more money?

Mr. NUTTLE. No, sir, they are split up and not getting anywhere. That is the way I feel about it.

Representative HYDE. All right. Thank you, Mr. Nuttle.

Mr. NUTTLE. We will be available if you want to question any of us at any time. We will be glad to come over.

Representative HYDE. Thank you, Mr. Nuttle.

(The full statement of Mr. Nuttle is as follows:)

I am a member of the board of regents, Maryland University, and have served in both the house of delegates and senate of our general assembly. I now serve on the central board of directors of the Southern States Cooperative, and the national board of directors of the National Rural Electric Cooperative Association, representing the electric cooperatives in Maryland. I have been secretary-treasurer of the Choptank Electric Cooperative, with headquarters in Denton, since the co-op was organized in 1937. We serve 12,000 members in 9 counties of the Eastern Shore.

To further conserve the time of this committee, I have been asked to also represent here today the several electric cooperatives in Virginia and Pennsylvania. Together we serve approximately 100,000 members who could benefit considerably from full development of the resources of the Potomac River.

Recently I read a couple of short quotations from one of the great Senators of all time, Senator George Norris, of Nebraska, and I would like to put them into the record at this point. "Every stream in the United States which flows from the mountains through the meadows to the sea has the possibility of producing electricity for cheap power and cheap lighting, to be carried into the homes and businesses and industry of the American people." At another time, while talking about the Potomac River, he pointed out that "it is a moral sin that within the shadow of the dome of the Capitol one of the greatest waterpower possibilities is being wasted while we investigate and investigate." More than 30 years later we are still investigating.

The announced purpose of these hearings was limited to consideration of certain reports to the committee on water supply, water pollution, conservation, and recreation in the Washington metropolitan area. During the short time these reports have been available to us, we have read them with great interest. We were convinced before, and are more certain now, that we have a responsibility to take an active interest in any phase of Potomac River development. It is true that we are primarily interested in Potomac River development to secure the large potential of low-cost electric power it is capable of producing, and therefore to relieve us from the pressure of high electric rates and secure an additional supply of power. Such relief would enable our farmer members to make the widest and most efficient use of electric energy at a time when electric power is becoming a sizable part of their expense. I wish I could take the time to tell

you of the dramatic manner in which many of our progressive Eastern Shore farmers are using electricity. For example, Brooks Nagel, one of our members who lives in Caroline County, has a large dairy farm, paying more than a hundred dollars a month for electric power. The cows are milked with electric-milking machines. The milk goes from the cow to your front doorsteps here in Washington without ever being exposed to the air. The milk is pumped from the milking machines into a large refrigerated tank where it is collected by Lucerne Dairy by being pumped into a large tank truck. Each of these operations are dependent on electric power as are 400 other known uses in the farm-home and on the farmstead, such as running water, elevators, feed grinders, hay dryers, heat lamps, and irrigation pumps.

We are here today because we feel first, that one or more phases of Potomac River development cannot be considered without cutting across all phases of multiple-purpose river basin development, and second, we feel that inclusion of hydroelectric facilities is necessary to economic feasibility. Also, we believe there are certain parts of the staff's reports on which we should express an opinion and give recommendations. Incidentally, we commend the committee for securing the services of a person so well qualified to analyze the subject of water supply and pollution. It seems to us that Mr. Levin's formal training at Johns Hopkins University and his expeirence in several related fields, eminently qualify him as an authority on these problems.

In our opinion, failure to approach the Potomac River problem on a multiple-purpose basis will impair the future growth of this part of our country. We wish to point out that regulation of the flow of water is not usually done for water supply alone. In this case, water supply is the dominant need, but not the only one.

As Mr. Robinson has indicated, we must develop our water resources in the public interest. We believe, along with many others, that water needs can be fulfilled most economically through multiple-purpose storage reservoirs which are coordinated for maximum use of water. It seems to us Mr. Levin demonstrates that the Potomac River must be impounded to conserve every drop of water that can possibly be made available, as many other authorities have done in recent years. The immediate future needs of this rapidly expanding area put us in the position where it is no longer a question of upstream or downstream engineering—we must have both.

We also believe that the Federal Government cannot and should not avoid the responsibility of the municipal water supply needs of the Nation's Capital including the entire metropolitan area, on a reimbursable basis by those who are served, of course. To postpone its responsibility will result in much higher costs lated on. It seems clear to us that the demands on water supply in this area dictate that the Federal Government must step in as soon as possible and fully develop the Potomac River. This recommendation is in conformity with the multiple-purpose concept and unified development approach established by former President Theodore Roosevelt, whose 100th birthday anniversary we celebrate this year.

We appear here in full support of the comprehensive development of the Potomac River by the Corps of Engineers at the earliest possible time. We believe it is beyond the scope and ability of any other agency to fully develop the river's rich resources, and we urge this committee to recommend that the Corps of Engineers be given adequate funds to complete its current study at the earliest possible time, so the needs of the area can be met in time to avoid jeopardy to the future water supply. We also feel that carrying out the Corps' plans is a Federal responsibility and one that can only be done promptly and efficiently by something more than an interstate organization. Experience in this country has proven that multipurpose river development simply cannot be done by interstate compact--at least it has not been done. Our neighbors in Delaware, Pennsylvania, New Jersey, and New York tried it several years ago on the Delaware River with an interstate organization commonly known as Incodel, and finally ended up recommending the Federal Government do the job after years of useless arguing with no results. We recommend a Federal Interagency Committee with State representation such as has been done in the Columbia River Basin.

We also want to point out to the committee that very few cities have the opportunity for water resources development as close by as Washington does. Most other cities must go many miles away, and to great expense, to build conduits for water and transmission lines for electricity, burdening its citizens with additional tax expense. Here we have a source of water literally in our own front yard, and capable of producing revenue from its resources that would make several

benefits available at minimum costs to the citizens in the area. Revenue from water supply and low-cost electric power would help considerably to bring about pollution abatement, flood control, and the type of recreation facilities which would benefit the greatest number.

We have been very much concerned about information presented to the public by others, about the interests of the electric cooperative in Potomac River development. It has been said that the number of people affected is small, the amount of electricity which would be available from hydroelectric facilities is small, that hydroelectric installations will be obsolete in the near future, and that the commercial power companies in the area will be able to take care of our future needs. Of course, this sounds very much like the information that was passed out in the middle thirties, when it was claimed that the 10 percent of farms in this country then receiving electric service was all that would use enough to make it economically worthwhile. Less than 10 percent of our Eastern Shore farmers had electric service and in most cases even those few had to pay for the line in order to secure the service. Today about 95 percent of our farms have the wonderful benefits of electricity, but in this area at least it is available at a very high cost. Also, farmers are doubling their use of electricity every 5 to 7 years, and we are concerned about future supply as well as continuous rising costs.

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Incidentally, millions of other people would also benefit, for the introduction of low-cost hydropower in various areas of this country has proven that the competitive influence of such power forces down electric rates to urban and rural people alike. It is interesting to compare the influence on retail electric rates of even a threat to hydro development by the Federal Government, or construction of a generating plant by electric co-ops. We have two good examples in this area. Several years ago the 16 electric co-ops in Virginia paid about 11 mills for wholesale electric power. Today, although electric rates of most utilities have been going up in recent years, the Virginia co-ops are paying less than 7 mills for power from the John Kerr Dam on the Roanoke River and about 8 mills for power purchased from the power companies. In the early twenties, Senator Norris tried in vain to get the Potomac River developed, but his efforts did bring the sliding-scale rate adjustment plan to Washington, which resulted in comparatively low rates for this area. I would like to put in the record at this point a comparison of the rates in Baltimore and Washington for each year, beginning with 1924.

Here are two cities that should have about the same rates, but it is interesting to note the sharper decline in Washington rates after 1924. However, since 1948 the rates of both cities began to increase and have climbed at about the same rate since. This situation should concern everyone in this area, when we have at our doorstep the great hydroelectric potential of the Potomac River. A Potomac Electric Power Co. representative told a Maryland legislative committee that his company was not interested in hydroelectric power from the Potomac River. We are interested in such power and we know why they are not interested, at least we are guessing, although we feel they should be. Adequate water supply is needed for their generating plants and more will be needed in the future. Also, they should be able to use hydropower for peaking and standby at a handsome profit.

According to the Corps of Engineers' report of 1944, the Potomac River fully developed, has hydro capacity of 694,000 kilowatts, with an annual output of 2.3 billion kilowatt-hours. Experts in the business believe such a great quantity of power could be produced at less than 8 mills, including reasonable delivery. On the Eastern Shore we are now buying more than 40 million kilowatt-hours at a little less than 13 mills. The Delaware co-op is paying the same rate. A saving of even 1 mill means more than $40,000 a year to our co-op mem-

bers. Our friends in southern Maryland are paying about 10 mills. Of course the power companies will take care of our needs as long as they can charge such rates. A report in the annual statistical issue of Electrical World, issued January 27, 1958, indicates that more rate increases can be anticipated in the future.

We want to impress on everyone we can that our need is great, persons affected are many and the money involved is large.

I need only to refer briefly to what is being said by experts in the electric industry, and what is being done all over the world, to refute the asinine statements that the need for hydroelectric power will soon become obsolete. At a recent panel discussion of top leaders in the electric-power industry, sponsored by the EBASCO engineering firm and reported in the March 1, 1958, issue of the electric industry's principal publication, Electrical World, it was determined that by 1975 United States capacity will hit 410 million kilowatts, annual generation will approximate 1,850 billion kilowatt-hours, and "These figures are roughly thrice 1957's and signify an annual growth rate of over 6 percent"; also, "that about 55 million kilowatts of the 410 million capacity could be hydroelectric and 30 million kilowatts nuclear plants." As of 1957, hydro installations in this country amounted to about 28 million kilowatts, therefore it will be about doubled by 1975. The report also commented on the desirability of peaking hydroelectric facilities, even pump-storage hydro projects, coordinated with the nuclear plants to come. So, it seems clear that other sources of fuel-generated power will make hydroelectric projects more attractive and the combination, more economical; certainly not obsolete. In passing, I feel we need only to review reliable and recent reports of the extensive hydroelectric developments in Russia, completed and under construction, indicating that we are falling behind in this race, and indicating also that Russia fully realizes the need for adequate electric power in preparing for industrial and arms expansion.

We agree with Mr. Frank in his conclusion that with respect to recreation, the needs of the people in the Potomac River Basin must be considered as an entire region. We cannot resist a brief comment on recreation benefits for it seems to us the rapidly growing needs of this area for recreation facilities for the greatest number should be one of the important considerations of this committee. Important concessions have been made to recreation interests to not only preserve the scenic beauty of the river, but enhance the recreation benefits. The site of River Bend Dam was moved upstream and around the first bend in the river so as not to impair the beauty of Great Falls. Incidentally, a year-round controlled flow of water over the falls will improve their beauty. The height of the proposed Chain Bridge Dam was lowered so as to flood the rocky flats downstream, but not flood out the Chesapeake & Ohio Canal below the dam nor the valuable parklands bordering the canal. According to Frederick Law Olmstead, former member of the National Capital Park and Planning Commission "this would not only make possible public bathing facilities for superior in value and popularity to anything that could be provided either on a lake at a higher elevation or on the natural river, but it would retain practically unimpaired all of the other great scenic and recreational values inherent in this part of the valley." The canal would remain for the use and interest of posterity from Washington to River Bend Dam, more than adequate it seems to me, when you consider the other recreation facilities provided by River Bend Reservoir. Just imagine the increased recreational opportunities from a 40-mile-long lake above River Bend Dam for boating, fishing, swimming, and other water sports, all within a few minutes' drive from the metropolitan area of Washington. The attempted scare by opposition as to the creation of mud flats seems ridiculous, when the experience of recreation benefits from other reservoirs are considered, as Mr. Levin points out in his report.

Mr. Chairman, we strongly recommend your committee do what it can to get on with the job of multiple-purpose development of all the river's resources in the most economical manner possible. We have great sympathy with landowners whose land will be inundated, particularly farmers, but they will be adequately paid and we can't have necessary progress without dislocation. It seems to us Mr. Levin's report supports the view of the Corps of Engineers in 1944, the current feeling of the Washington Suburban Sanitary Commission, Dr. Abel Wolman, Mr. Auld, and others, that the river must be impounded for water supply and pollution abatement, and that River Bend Dam offers the only solution for the reasonable future (2025); also the most economical solution

(high River Bend $13.50 per million gallons). At this point I would like to insert in the record a quotation from the testimony in letter form of Mr. Harry B. Shaw, chief engineer of the Washington Suburban Sanitary Commission, at the public hearings held by the Corps of Engineers last summer in Rockville, Md. He found it "obvious that serious consideration should be given to utilizing the necessary letdowns from the Potomac River impoundment for power purposes." He continued, "Large quantities of water will have to be let downstream in any event at all times for Washington water supply purposes and for sewage dilution purposes in the Washington metropolitan area so it appears quite logical to let this water flow through turbines and develop power in doing so." He stated further, "In conclusion it appears to me that any impoundment of the Potomac River, particularly in the vicinity of River Bend must be a multiple-purpose impoundment and the cost of the dam and the reservoirs should be allocated to the respective purposes for which the project is constructed. In turn the agencies which utilize the various facilities provided by the impoundment should pay for their use on a proportionate basis, that is they should pay their pro rata share of the whole cost of the impoundment assigned to the particular use which they make of it."

If there is any finding of your committee that the current study of the Corps of Engineers is not developing interagency coordination to the end that there will be no further delays, we recommend you to use the full influence of your committee to bring about improvement. The Corps of Engineers is the agency that has the responsibility for the current study, by direction of the Congress, and we must all do what we can to support its activities. We encourage the committee to consider all aspects of metropolitan area problems as they relate to the Potomac River, including the benefits hydroelectric power will contribute to a total program of comprehensive development.

If we can furnish additional information to the committee, please let us know. This opportunity to appear before your members and staff is appreciated.

PENN.
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MD
POTOMAC R.
RIVER BEND
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11,000
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VA.
POTENTIAL POWER SITE
ELECTRIC CO-OP

NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION,
Washington, D. C., April 25, 1958.

Hon. DEWITT S. HYDE,
Vice Chairman, Joint Committee on Washington Metropolitan Problems, House of Representatives, Washington, D. C.

MY DEAR CONGRESSMAN HYDE: Allow me to express our appreciation for your courtesy during the April 23 presentation of testimony concerning development of the Patomac River before the Joint Committee on Washington Metropolitan Problems by Mr. Harry Nuttle, of Denton, Md., and myself.

I am intrigued by your observation, that the relatively low retail electricity rates in Washington, as compared to Baltimore, which have been in effect since 1924, constitutes presumptive proof that low electric rates can be achieved by effective regulation and that this rate differential between geographically close cities is not attributable to early attempts to develop the Potomac River for hydroelecric power.

Subsequent to the hearing before your subcommittee, I did a bit of research on this issue, the results of which may be of interest to you. Appendix 5 of the Fourth Annual Report of the Power Authority of the State of New York, published in 1935, bears directly on the problem and yields the following information:

In 1920, Senator George Norris urged immediate development of the power project at Great Falls on the Potomac River. But his bill was met by a demand for an investigation, and, after some legislative maneuvering, the Corps of Engineers, in January of 1921, submitted a report over the signature of Maj. M. C. Tyler, at that time the district engineer for Washington, recommending the building of dams and reservoirs on the Potomac to include power features. The Board of Engineers for Rivers and Harbors and the FPC approved the Tyler plan and recommended it to Congress. And in April of 1921, the Senate adopted an amendment which added $200,000 to the Army appropriation bill for the first stage of power development at Great Falls in accord with the Tyler report.

The Senate-House conferees on the Army appropriation bill struck the amendment, however, at the suggestion of the Secretary of War, Mr. Weeks. However, during the next 3 years, the Great Falls project was revised with the endorsement of Secretary Weeks, who at that time was also acting as Federal Power Commission Chairman, and Secretary of Commerce Herbert Hoover. Senator Norris introduced another bill authorizing the Congress to proceed. The Commissioners of the District of Columbia recommended enactment of the Norris bill, with the suggestion that a provision be attached authorizing the District Public Utilities Commission to require any public utility in the District to purchase electricity from the plants subject to the Commission's rates and regulations.

On April 10, 1924, the Norris bill passed the Senate unanimously.

The Potomac Electric Power Co. was, at that time, resisting efforts of the Public Utilities Commission to reduce its rates and was opposing passage of the Norris bill through the House of Representatives. President William F. Ham of Pepco told the House committee that his company was eager to secure Potomac power if it could be obtained at lower cost than power generated by the company but the savings on the average customer's bill from use of Potomac power would not exceed 4 cents per month. He also contended that there would be no adequate market for Potomac River power.

In January of 1925, the House committee favorably reported a substitute for the Norris bill providing that, before construction could begin, contracts should be made with private companies for distribution of the electricity or, in the alternative, for leasing the plant. It was at about this time, on December 31, 1924, that the supreme court of the District of Columbia entered a consent decree pursuant to which the Potomac Electric Power Co. entered into an agreement with the Public Utilities Commission by which the rate reduction dispute was settled by adopting a sliding scale formula for fixing rates. Under this formula, in any year one half the surplus earnings over a fixed rate of return would be placed in surplus and a rate reduction effected during the next year. Pursuant to the consent decree the top rate in the company's residential rate schedule was cut immediately from 10 cents to 7.5 cents per kilowatt-hour. And within 10 years the top rate had, pursuant to the sliding scale scheme, fallen to 3.9 cents per kilowatt-hour. The Norris bill to authorize development of the Potomac ultimately failed to win passage.

It is, of course, possible to conclude that the agreement reached between the Potomac Electric Power Co. and the Public Utilities Commission was entirely

unrelated to the immediately prior action of the Senate in passing authorization for construction of the Federal hydroelectric plant on the Potomac and to the favorable report of such legislation in the House of Representatives.

In our opinion, however, it is far more reasonable to infer that there was a distinct causal connection between the two events.

I was also deeply interested during the hearings by your statements concerning the relative desirability of hydro and steam electric generating capability. I inferred that in your opinion hydro capacity might become an insignificant or undesirable source of energy as nuclear power develops on a competitive basis.

In this connection, you may be interested in an article which appeared in the March 10, 1958, issue of Electrical World, a McGraw-Hill publication which is generally recognized as the leading trade journal of the private utility industry.

In that issue, at page 53, there appears an article entitled "United States Capacity Will Hit 410 Kilowatts in 1975."

A portion of this article reads as follows: "About 410 million kilowatts of capacity will be needed to meet 1975 loads and provide necessary reserves. About 55 million kilowats of this capacity could be hydro. The remaining 355 million kilowatts would be provided by steam and nuclear plants, an optimistic guess putting the latter at about 30 million kilowatts."

Thus, the Electrical World forecast indicates that approximately 13.4 percent of private utility generating capacity will be hydroelectric in 1975.

The January 27, 1958, issue of Electrical World, which contains the Electrical World Industry Statistics—54th Annual Report, states, at page 94, that between 1957 and 1960 the electric industry of the United States will add some 10 million kilowatts of hydroelectric capacity to existing systems.

I think it is quite correct to assume that, as the demand for electricity in the country continues to expand and as the better hydroelectric sites are developed, hydroelectric capacity as a percentage of total installed capacity will decrease over the years. But I also think that the plans of the industry to continue adding hydroelectric capacity where it is economic indicates the economic advantages inherent in its use as well as the fact that the private utility industry believes that these advantages will not be appreciably diminished by the advent of nuclear power.

Again may I express our thanks for the opportunity to appear before your committee, and we hope that you will feel free to call upon us at any time we may be of service.

Sincerely,

CHARLES A. ROBINSON, JR.,
Staff Engineer.

Representative HYDE. Mr. Machis.

For the record, would you state your full name and whom you represent?

STATEMENT OF HARRY B. SHAW, CHIEF ENGINEER, WASHINGTON SUBURBAN SANITARY COMMISSION, PRESENTED BY ALFRED MACHIS, ASSISTANT TO THE CHIEF ENGINEER

Mr. MACHIS. My name is Alfred Machis, assistant to the chief engineer of the Washington Suburban Sanitary Commission. Mr. Harry B. Shaw, the chief engineer of the sanitary commission, has prepared a statement which he had hoped to present to this joint committee. However, he had a previous commitment to attend the American Waterworks Association convention in Dallas, and has been unable to come here. I am presenting this statement for him:

The writer was much interested in the summary of major problems requiring attention, on pages 25 and 26 of the staff report prepared for the Joint Committee on Washington Metropolitan Problems on Water Supply in the Washington Metropolitan Area, dated April 1958. With your permission, I would like to answer these questions

seriatim, giving the staff questions first and following it by an appropriate answer:

1. How shall an adequate source of water supply be provided for the present and future needs of the area? This question primarily resolves itself to: "What type of storage facilities should be provided on the Potomac River?"

It is no longer debatable, I believe, that the impoundment of the Potomac River will be necessary to provide for the needs of the communities within its watershed, of which the Washington metropolitan area is the greatest. The question then, as stated in the summary, resolves itself to: "What type of storage facilities should be provided on the Potomac River?" The Army engineers are making a complete study at this time of the Potomac River Basin, and their report should be able to establish, by facts, what should be done. I hope that Congress will be liberal in appropriating to the Army engineers the necessary funds to enable this to be done expeditiously.

2. Should the water-supply systems in the Washington metropolitan area be consolidated, either administratively or physically, or both?

In my judgment, it would be a mistake to attempt to work out the consolidation of the water-supply systems in the Washington metropolitan area, either administratively or physically. To do this, it must be established to the satisfaction of all jurisdictions concerned that it is the economical and proper thing to do. Actually, I do not believe that it is, because of the great amount of existing facilities which have been constructed, using other premises, the great cost of providing the necessary adjustments in the supply and distribution systems, the differences in topography of the various jurisdictions concerned, and the difficulty of establishing the merits of the proposal to the people in the various parts of the Washington metropolitan area. To start off with, there is no proof at all that consolidation of water-supply systems is a good thing. Certainly, in this day and age, it is not a good thing to put all your eggs in one basket.

Representative HYDE. Mr. Machis, would you have your commission give us a few more facts in connection with that answer?

Mr. MACHIS. Yes, sir.

Representative HYDE. For the most part, they are conclusions. You ask other folks, possibly this committee, or whoever it is that might be making the argument, to prove to you factually that it is an economical thing to combine administratively and physically. The committee would like to have more facts from you to show that it is more economical and more efficient to continue in the way that we have been.

You make a few statements here to substantiate your conclusions, but, for the most part, they, themselves, are just conclusions. Now, we would like to have a little more factual data in connection with that answer.

Mr. MACHIS. Yes, sir.

Representative HYDE. I am sure you understand what I mean by facts. It sometimes is pretty difficult to get a good many people to separate facts from conclusions. But what we would like to have is facts.

Mr. MACHIS. We will be happy to submit additional information on that.

Representative HYDE. Thank you, Mr. Machis.

Mr. MACHIS. 3. What steps can be taken to assure that future decisions affecting water supply can be made in a spirit of cooperative area planning rather than community competition?

I am satisfied that the need for cooperation between the various jurisdictions will become so obvious within the next 10 years, or sooner, that there will not be any great difficulty in arriving at an agreement for the impoundment of the Potomac River for the needs of the Washington metropolitan area. For the information of the committee, I quote you herewith the attitude of the Washington Suburban Sanitary Commission, as stated in a letter dated December 11, 1956, to the department of geology, mines, and water resources:

Mr. ARTHUR B. STEWART,
Chairman, Department of Geology, Mines, and Water Resources,
The John Hopkins University, Baltimore, Md.

DEAR MR. STEWART: At the hearing on the commission's application to divert the natural flow of the Potomac River for water supply purposes of the sanitary district, you requested that I submit a draft of conditions under which such a permit would be issued which are acceptable to this commission. Such a suggested draft is herewith submitted:

"This permit is issued with the understanding that, when it is necessary to impound or otherwise regulate the waters of the Potomac River in the vicinity of the proposed River Bend dam site in order to provide adequate flows at all times for legitimate uses of the river in the Washington area, the applicant will join with other users of the waters of the river in the Washington locality, including the Pnited States Government, in paying its pro rata share of the cost of such impoundment and regulation works based upon the ratio that the cost of such works as would be required to assure the diversion of the flow of the river requested bears to the part of the cost of the project assigned to water supply, it being contemplated that the impoundment and regulation works constructed at River Bend will also provide water storage for, in addition to water supply, sewage dilution, flood control, navigation, irrigation, recreation, and power."

This draft has been submitted to the Commission and I am authorized by them to advise you that the draft is acceptable to them.

Very truly yours,

(Signed) HARRY B. SHAW,
Chief Engineer.

Approved December 11, 1956:

(Signed) T. E. BOURNE.

Also I would point out to you the agreement between the District of Columbia and the Washington Suburban Sanitary Commission relative to the disposal of sewage from the latter jurisdiction by conveyance in the District of Columbia system to the District of Columbia sewage treatment works. It is working perfectly well and with the experience that has been gained from it will make it easier to reach agreements as to matters in which all the jurisdictions in the Washington metropolitan area are concerned.

Representative HYDE. In connection with that answer, it seems to say to me that you agree we should work jointly and cooperatively, but do it separately?

Mr. MACHIS. That is correct, Mr. Chairman.

Representative HYDE. And, secondly, I would like to know—I have heard this matter of differences of topography; I am not a topographical engineer, but it seems to me we are all part of the gently rolling Piedmond region going toward the mountains, in this 2,000 square

mile area. Just what are those differences in topography that make any more cooperation or cooperative action than we now have impossible or impracticable? If you could give us the answers to that, I would appreciate it.

Mr. MACHIS. Yes. The Commission has a number of pressure zones within its area, and the water system is designed to operate in these zones. Historically it has developed in that fashion. Each zone has its own pressure. In all there are seven pressure zones in Washington Suburban Sanitary District.

Representative HYDE. That is all within the present district?

Mr. MACHIS. That is within the present district. These zones are necessitated by the fact that it is undesirable to provide water at excessive pressures into homes. At the same time, we are limited, on the other hand, by having to provide certain minimum pressures in order to supply adequate service.

We supply water to Prince Georges County from the Patuxent water treatment plant by gravity flow down as far as Carmody Hills. It is anticipated that our future water supply will come—be augmented, actually, augmenting the Patuxent treatment plant by furnishing water from the Potomac River.

Plans for this construction are now being prepared and it is anticipated that construction will be underway very shortly.

This water will need to be lifted into the Montgomery areas. The zones of Montgomery County are higher than those of Prince Georges, and consequently water cannot be furnished in the reverse fashion—it cannot flow from Prince Georges County zones into the Montgomery.

Similarly, the District of Columbia is also organized to furnish water to its area in a number of zones. These zones are of such a nature that they are not able to furnish the water that we would need from their existing system. They never constructed their system with the idea that that was necessary.

Representative HYDE. You do use water from that system, don't you?

Mr. MACHIS. We do, in a very limited amount. We obtain water from the District of Columbia at several connections on the boundary in a magnitude of possibly four and a fraction million gallons a day during periods of very high summer consumption. This compares with our total high consumption of last summer of the magnitude of 75 million gallons a day. We do not use these connections all year round. We use them only under conditions where the pressure may be boosted in certain local areas that have deficiencies adjacent to the District of Columbia boundary. The magnitude of water taken from the District of Columbia is extremely small by comparison with our total water demand.

Representative HYDE. Well, Mr. Machis, you have water intakes in Prince Georges County, or water supplies in Prince Georges County, which you cannot take to certain parts, economically, of Montgomery County, because of differences in levels?

Mr. MACHIS. Excuse me, Mr. Chairman. It can be taken, but it needs to be pumped.

Representative HYDE. I understand that. But you don't do it as a practical economical matter simply because of the differences in levels.

Mr. MACHIS. Not by gravity flow. You need to pump. Actually we are——

Representative HYDE. How are the differences within the district any different from the differences between the sanitary district and the District of Columbia?

Mr. MACHIS. Well, we are, generally speaking, at higher elevations than the District of Columbia.

Representative HYDE. I understand that. But so is Montgomery County at a higher elevation than Prince Georges.

Mr. MACHIS. That is correct. Now, in order to turn water from the District of Columbia there would need to be considerable expense, money spent, for the construction of additional facilities.

Representative HYDE. Why would you have to furnish water from the District of Columbia to Montgomery County? You don't furnish water from Montgomery County to Prince Georges County.

Mr. MACHIS. That would be true whether you furnished it to either Prince Georges or Montgomery from the District, Mr. Chairman.

Representative HYDE. All right. Thank you. Will you go on, Mr. Machis.

Mr. MACHIS. (4) How can the Potomac River upstream from Washington be protected against future pollution from residential, commercial, and industrial development?

It is my belief that the duly authorized local health and planning agencies have the necessary authority and will take the necessary action to control pollution of the Potomac River above Washington in a proper manner.

Representative HYDE. Is it the conclusion of your Commission that that is being done today?

Mr. MACHIS. I think generally that has been done rather well. We have cooperated with adjoining agencies, municipalities, and other counties in the elimination of pollution of the streams of the metropolitan area. Specifically I am speaking of the city of Rockville, in which we have joined with them in a cooperative agreement to take their sewage into our system and convey it through our system to the District of Columbia system for ultimate disposal.

We have also joined cooperatively with the Howard County authorities for the supply of water from the Sanitary Commission facilities to facilities which they have constructed.

Representative HYDE. Are the regulations along the river now uniform among the three jurisdictions? That is, health regulations with respect to pollution?

Mr. MACHIS. Of the three jurisdictions?

Representative HYDE. Yes—Maryland, Virginia, and the District of Columbia.

Mr. MACHIS. I am not able to answer that, Mr. Chairman. I do not know.

Representative HYDE. All right, sir. Thank you. You may proceed.

Mr. MACHIS. (5) For what period into the future should plans and construction be undertaken?

Dr. Abel Wolman and I, in separate reports to the Washington Suburban Sanitary Commission, projected the Sanitary District water supply needs to the year 2000. It is to be noted that both of us look beyond the year 2000 to the Potomac River to augment the water supply needs at that time. For the information of the committee,

the Commission's 40-year projection is to be accomplished in 4 steps, beginning in 1960 and ending in 1990.

(6) What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

The Washington Suburban Sanitary Commission's water supply projects are financed by the proceeds of bond issues retired by water consumption receipts. This has been successful, augmented by an ad valorem tax, for a period of 40 years. All I can say is that this has been a good plan but I would be very hesitant about telling other jurisdictions what financial plan to adopt. It is agreed, as stated by the committee staff, that water supply and sewerage problems are really part of a single concept, barring proper water use.

Representative HYDE. What does that mean?

Mr. MACHIS. I think Mr. Shaw had in mind there that there are possibly certain uses of the water, as for example, irrigation, power, recreation, which are possibly not tied together as closely to sewerage problems as municipal water supply is.

Representative HYDE. Not tied to sewage problems. But you say that—

> It is agreed, as stated by the committee staff, that water supply and sewerage problems are really part of a single concept, barring proper water use.

You mean proper water use is not part of a single concept of water supply?

Mr. MACHIS. I don't think Mr. Shaw meant that, no. I believe he had in mind what I had indicated, that there are possibly certain uses which are not necessarily a single concept to be considered as operated by a single agency, such as the Washington Suburban Sanitary Commission.

Representative HYDE. Well, are you saying that you agree with the Commission's staff that water supply and sewage problems in the area are part of a single concept?

Mr. MACHIS. Yes. I think I intended that.

Representative HYDE. All right. You may proceed.

Mr. MACHIS. While I read the various publications which accompanied your invitation with much interest and pleasure, I would point out with respect to paragraph 5 on page 22 of the staff report dated April 1958, that it will not be necessary to detour around the District of Columbia water mains carrying Potomac River water in order to supply Prince Georges County. As a matter of fact Prince Georges County for many years to come will be supplied with water from the Patuxent River and it probably will not be necessary until around 1980 to augment the water supply to Prince Georges County with water from the Potomac River.

This will be done by the construction of a connecting main between the existing systems and in no sense can be considered a detour. The cost of such connecting main would be much less than the cost of building the necessary augmenting main through the paved streets of the District of Columbia.

I would also not underestimate the possibilities of serving certain populous areas, although some distance away from the main features of the distribution systems, by well supplies. While wells never will be a major factor in solving the water-supply problems of the area

in general, they can be made to serve a very useful and economical purpose.

Mr. Chairman, that concludes the statement prepared by Mr. Shaw. I would very much like to have that inserted into the record. And he has also, in addition to it, enclosed a copy of a letter which he sent to Col. George B. Sumner, district engineer of the Corps of Engineers. This letter was prepared in reply to a request on the comprehensive water-supply development of the Potomac River Basin, with the accompanying hearings. I did not intend to read this letter, but I would also like to have this presented to the committee, and inserted as part of the record.

Representative HYDE. It will be received and made a part of the record at this point.

(The letter referred to is as follows:)

WASHINGTON SUBURBAN SANITARY COMMISSION,
Hyattsville, Md., April 14, 1958.

Hon. ALAN BIBLE,
United States Senate, Washington, D. C.

MY DEAR SENATOR BIBLE: Thank you very much for your invitation to participate in a series of public hearings on Potomac River water problems of importance to the Washington metropolitan region by the Joint Committee on Washington Metropolitan Problems.

Unfortunately on April 22, the date set for the hearing, I will be in Dallas, Tex., attending the annual conference of the American Water Works Association. It is with regret, therefore, that I will be unable to attend the hearing, but in lieu thereof I would like to present the attached statements for the record, the first of which I would like to be presented to your committee by Dr. Alfred Machis, my assistant, who will also be glad to attempt to answer my questions on the subject matter which you or your colleagues may desire to ask.

Very truly yours,

HARRY B. SHAW, *Chief Engineer.*

STATEMENT BY HARRY B. SHAW TO THE JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS

The writer was much interested in the summary of major problems requiring attention on pages 25 and 26 of the staff report prepared for the Joint Committee on Washington Metropolitan Problems on Water Supply in the Washington Metropolitan Area, dated April 1958. With your permission I would like to answer these questions seriatim, giving the staff question first and following it by an appropriate answer.

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It is no longer debatable, I believe, that the impoundment of the Potomac River will be necessary to provide for the needs of the communities within its watershed, of which the Washington metropolitan area is the greatest. The question then, as stated in the summary, resolves itself to "What type of storage facilities should be provided on the Potomac River?" The Army engineers are making a complete study at this time of the Potomac River Basin and their report should be able to establish by facts what should be done. I hope that Congress will be liberal in appropriating to the Army engineers the necessary funds to enable this to be done expeditiously.

2. Should the water supply systems in the Washington metropolitan area be consolidated either administratively or physically, or both?

In my judgment it would be a mistake to attempt to work out the consolidation of the water supply systems in the Washington metropolitan area either administratively or physically. To do this it must be established to the satisfaction of all jurisdictions concerned that it is the economical and proper thing to do. Actually, I do not believe that it is because of the great amount of existing facilities which have been constructed, using

other premises, the great cost of providing the necessary adjustments in the supply and distribution systems, the differences in topography of the various jurisdictions concerned, and the difficulty of establishing the merits of the proposal to the people in the various parts of the Washington metropolitan area. To start off with, there is no proof at all that consolidation of water supply systems is a good thing. Certainly in this day and age it is not a good thing to put all your eggs in one basket.

3. What steps can be taken to assure that future decisions affecting water supply be made in a spirit of cooperative area planning rather than community competition?

I am satisfied that the need for cooperation between the various jurisdictions will become so obvious within the next 10 years, or sooner, that there will not be any great difficulty in arriving at an agreement for the impoundment of the Potomac River for the needs of the Washington metropolitan area. For the information of the committee, I quote you herewith the attitude of the Washington Suburban Sanitary Commission as stated in a letter dated December 11, 1956, to the department of geology, mines, and water resources:

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Chairman, Department of Geology, Mines, and Water Resources,
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DEAR MR. STEWART: At the hearing on the commission's application to divert the natural flow of the Potomac River for water supply purposes of the sanitary district, you requested that I submit a draft of conditions under which such a permit would be issued which were acceptable to this commission. Such a suggested draft is herewith submitted.

"This permit is issued with the understanding that when it is necessary to impound or otherwise regulate the waters of the Potomac River in the vicinity of the proposed River Bend Dam site in order to provide adequate flows at all itmes for legitimate uses of the river in the Washington area, that the applicant will join with other users of the waters of the river in the Washington locality, including the United States Government, in paying its pro rata share of the cost of such impoundment and regulation works based upon the ratio that the cost of such works as would be required to assure the diversion of the flow of the river requested bears to the part of the cost of the project assigned to water supply; it being contemplated that the impoundment and regulation works constructed at River Bend will also provide water storage for, in addition to water supply, sewage dilution, flood control, navigation, irrigation, recreation, and power."

This draft has been submitted to the commission and I am authorized by them to advise you that the draft is acceptable to them.

Very truly yours,

(Signed) HARRY B. SHAW, *Chief Engineer.*

Approved December 11, 1956.

(Signed) T. E. BOURNE.

Also I would point out to you the agreement between the District of Columbia and the Washington Suburban Sanitary Commission relative to the disposal of sewage from the latter jurisdiction by conveyance in the District of Columbia system to the District of Columbia sewage treatment works. It is working perfectly well and with the experience that has been gained from it will make it easier to reach agreements as to matters in which all the jurisdictions in the Washington metropolitan area are concerned.

4. How can the Potomac River upstream from Washington be protected against future pollution from residential, commercial, and industrial development?

It is my belief that the duly authorized local health and planning agencies have the necessary authority and will take the necessary action to control pollution of the Potomac River above Washington in a proper manner.

5. For what period into the future should plans and construction be undertaken?

Dr. Abel Wolman and I, in separate reports to the Washington Suburban Sanitary Commission, projected the Sanitary District water supply needs to the year 2000. It is to be noted that both of us look beyond the year 2000 to the Potomac River to augment the water supply needs at that time. For the information of the committee, the commission's 40-year projection is to be accomplished in four steps, beginning in 1960 and ending in 1990.

6. What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

The Washington Suburban Sanitary Commissions' water supply projects are financed by the proceeds of bond issues retired by water consumption receipts. This has been successful, augmented by an ad valorem tax, for a period of 40 years. All I can say is that this has been a good plan but I would be very hesitant about telling other jurisdictions what financial plan to adopt. It is agreed, as stated by the committee staff, that water supply and sewage problems are really part of a single concept, barring proper water use.

While I read the various publications which accompanied your invitation with much interest and pleasure, I would point out with respect to paragraph 5 on page 22 of the staff report dated April 1958, that it will not be necessary to detour around the District of Columbia water mains carrying Potomac River water in order to supply Prince Georges County. As a matter of fact Prince Georges County for many years to come will be supplied with water from the Patuxent River and it probably will not be necessary until around 1980 to augment the water supply to Prince Georges County with water from the Potomac River. This will be done by the construction of a connecting main between the existing systems and in no sense can be considered a detour. The cost of such connecting main would be much less than the cost of building the necessary augmenting main through the paved streets of the District of Columbia. I would also not underestimate the possibilities of serving certain populous areas, although some distance away from the main features of the distribution systems, by well supplies. While wells never will be a major factor in solving the water supply problems of the area in general, they can be made to serve a very useful and economic purpose.

WASHINGTON SUBURBAN SANITARY COMMISSION,
Hyattsville, Md., May 24, 1957.

Col. GEORGE B. SUMNER,
District Engineer, Corps of Engineers, United States Army,
Washington, D. C.

DEAR COLONEL SUMNER: Your communication of May 23, 1957, advising that a series of public hearings will be held in the area on June 25, 26, and 27 by your office for the purpose of obtaining information in connection with a study of a comprehensive water development plan for the Potomac River Basin downstream from the mouth of the Shenandoah River, has been received by this office.

In the interest of conserving time at the hearings and because of the fact that this commission meets on the dates hearings would be held in Maryland and the District of Columbia, I am setting forth herewith the information which you apparently would desire to receive at these hearings from this commission. If after reading this letter there is any further information that you desire please do not hesitate to call upon us.

In your memorandum you listed some of the known problems of the region and the basic facts pertaining to them as far as this commission is concerned will be set forth in the order in which the problems are listed in your memorandum.

A. Water supply

On November 16, 1956, you were sent copies of the reports made by Dr. Wolman and myself on the Future Water Supply of the Washington Suburban Sanitary District. In brief, the commission is proposing to complete by 1960 the first stage of a development which contemplates originally diverting the natural flow of the Potomac River to augment the commission's present water supply. The following average and maximum flows which will be diverted to the commission's system for water supply purposes at the end of each decade follows:

[Million gallons per day]

	Average	Maximum
1970	12.6	21.4
1980	31.1	49.1
1990	52.7	81.5
2000	77.7	119.0

After the year 2000 it is further contemplated that the commission will obtain its additional water supply needs also from the Potomac River.

The commission's engineers in connection with their studies for augmenting the water supply of the sanitary district are firmly convinced that it will be necessary to impound the waters of the Potomac River in the future, and at least by 1970, at some point above Great Falls in the vicinity of the River Bend site. We are therefore, in preparing our plans for diverting the flow of the Potomac River for the commission's water supply, locating our intake, pumping, and treatment works above the site of the proposed impoundment of the Potomac in such manner or at such elevations that they will not be interfered with when the river is impounded at the location aforesaid.

B. Pollution abatement

One of the reasons for the commission's engineers being firmly convinced that it will be necessary to impound the flows of the Potomac River in the vicinity of the River Bend site is that it will be necessary, particularly during the months of low flow in the river, to let water downstream not only for the water supply of the District of Columbia but also to provide diluting water for the sewage effluents which will be discharged into the tidal portions of the river in the vicinity of Washington. In connection with this item, the points on which you desired information are answered herewith seriatim:

1. The commission has eliminated completely, or will have done so by the time the hearings are held, the discharge of raw sewage from its sewage system into the Potomas River or its tributaries. By agreement with the District of Columbia, the sewage from the sanitary district system is intercepted at various points along the District of Columbia-Maryland boundary line, conveyed thence by the District of Columbia sewers to the District of Columbia sewage-treatment plant and there treated. The estimated daily average sewage flows which will obtain for the years listed follows:

	Million gallons per day
1956	45
1960	54
1970	74
1980	96
2000	143

These flows do not comprehend the diversion of sewage from additional portions of the Patuxent River Valley not now planned into the Potomac watershed. However, they do include the possible treatment of sewage and the discharge of a highly treated sewage effluent into the waters of the Potomac River below Washington at locations as far south as Piscataway Creek.

At the present time, a secondary treatment plant at Gaithersburg treats the sewage from the Gaithersburg-Washington Grove area and discharges the effluent into Muddy Branch. However, the commission has under construction the extension of the Rock Creek trunk sewer north of Rockville, and contemplates the completion of pumping works and a sewage force main from Gaithersburg to Washington Grove by 1959, which will permit the abandonment of the Gaithersburg plant by pumping the sewage now treated there into the sewers in the Rock Creek watershed which, in turn, discharge into the District of Columbia system.

2 and 3. It is suggested that, as the commission's sewage is now being treated by the District of Columbia, the information on these points be obtained from the Department of Sanitary Engineering of the District of Columbia. The treatment provided at Gaithersburg has been stated.

4. Water-quality standards will have to be maintained which will safely allow the use of the waters of the Potomac River for water-supply purposes after treatment approved by the State department of health in a modernly designed, operated, and maintained filtration plant.

5. The sewage originating now and in the future in the sanitary district is and is expected to be domestic sewage and not particularly strong, due to the infiltration resulting from very great lengths of sewers located in stream valleys. While the commission is no longer operating its Anacostia sewage-treatment works, the biochemical oxygen demand there of the raw sewage during its last year of operation (1955–56) was about 141. Probably the biochemical oxygen demand of the future should be estimated in the neighborhood of 150 to 175 as, by improved jointing and construction methods, we are reducing very materially

the amount of infiltration in the sewerage system. On the other hand, this will be counteracted to some extent by the increased per capita consumption of water and the production of sewage in the succeeding decades.

C. Flood control

As you know, the commission is cooperatively engaged with your office in the Anacostia River Basin flood-control and navigation project, which is expected to be completed in 1958.

As the metropolitan area develops the surface runoff therefrom will also be correspondingly augmented at times of precipitation, and the metropolitan area will eventually be of such extent that this will be a factor which will have to be taken into account in considering future flood flows on the Potomac River. It is not believed, however, because of the great area of the Potomac River watershed, that it will be a factor of first magnitude and that it will be important locally rather than generally. In this connection, I would particularly call your attention to the flood problem which exists in the Oxon Run Valley between the mouth of Oxon Run and South Capitol Street in the vicinity of the Maryland-District of Columbia boundary line. The flooding of this stream is materially affected by high waters of the Potomac River, and it is recommended and hoped that a study will be made of this flooding problem by the Corps of Engineers and means taken by the Federal Government to alleviate it. It is not believed that the development along the left bank of the Potomac River immediately north and south of where Oxon Run crosses the District line, which, it would seem, might involve the George Washington Memorial Parkway or the approach roads to the Jones Point Bridge, can be properly solved until some steps are taken to relieve the periodic flooding of this area by waters of Oxon Run. In addition, there are several communities in Maryland which are plagued by this occurrence, principally Forest Heights. The situation is also going to grow progressively worse as the Oxon Run watershed area develops.

D. Recreation

This office believes, and has put in practice its belief, that water-supply reservoirs can be used to a considerable degree for recreational purposes, which, however, must always take into consideration the primary purpose of the reservoir. The Washington Suburban Sanitary Commission allows fishing from rowboats, electric-motor-powered boats, and the shore on its Rocky Gorge and Tridelphia Lake reservoirs. It also permits horseback riding along specified trails, and maintains picnic groves at various locations on its watersheds. This procedure has worked out satisfactorily as the result of enforcement of reasonable regulations and appreciation on the part of the public for the facilities that have been provided by their use. Because of the volume of the flow of the Potomac River and the dilution provided thereby, much more extensive recreational facilities could be provided than the commission has felt it is safe for it to provide. I see no reason why all types of powerboats and sailing craft could not be permitted on the waters of the Potomac River after impoundment, subject, of course, to proper regulations, in addition to the facilities provided by the commission on its reservoirs. I also believe that swimming under proper regulations could be permitted at chosen locations on the impounded Potomac River.

E. Irrigation

There has to be some provision made for providing water for irrigation purposes in considering any project for the impoundment of the Potomac River, but this should be gone into very carefully because, while supplementary irrigation is undoubtedly needed to an extent, I am afraid there has been some tendency to regard it in the nature of a fad. It is to be remembered that supplementary irrigation must be economically justified by the results obtained therefrom.

It is probably pertinent at this point to point out the necessity of considering weather modification in the area in lieu of or to reduce supplemental irrigation. We went into this matter several years ago with the idea of determining if it was possible to augment our water supplies by cloud-seeding operations, and came to the conclusion that it involved too great a financial outlay without definite assurance of results. However, the watershed of the Potomac River Basin is a much greater area, and it may develop that it would be more feasible to resort to cloud seeding to induce precipitation over the watershed in the Potomac River Basin than it was on our reservoir watersheds.

F. Industrial water

This area, while it has an appreciable amount of light industry, has no heavy industry of a kind which is a large consumer of water, nor is it expected, from the basic nature of the community, that large amounts of industrial water will be required. If it does develop that this is the case, there would seem to be a good possibility that these industries would be located on tidewater, possibly below Washington, in which case the feasibility of the use of treated tidal waters or sewage effluent should be considered.

Please understand that I am thinking fundamentally of the problems that exist as far as the Maryland suburbs of Washington are concerned, and do not intend to imply in any way that what I have to say applies to other parts of the Potomac River watershed.

G. Supplementary hydro power

I know that it has been a sore subject, in connection with the impoundment of the Potomac River, to mention the development of power. However, I would point out that it is obvious that serious consideration should be given to utilizing the neecssary letdowns from the Potomac River impoundment for power purposes. Large quantities of water will have to be let downstream in any event at all times for Washington water-supply purposes and for sewage-dilution purposes in the Washington metropolitan area, so it appears quite logical to let this water flow through turbines and develop power in doing so.

In conclusion, it appears to me that any impoundment of the Potomac River, particularly in the vicinity of River Bend, must be a multiple-purpose impoundment, and the cost of the dam and reservoir should be allocated to the respective purposes for which the project is constructed. In turn, the agencies which utilize the various facilities provided by the impoundment should pay for their use on a proportionate basis; that is, they should pay their pro rata share of the whole cost of the impoundment assigned to the particular use which they make of it.

Trusting that this may be of some value, I am,

Very truly yours,

(Signed) HARRY B. SHAW,
Chief Engineer.

Representative HYDE. Well, Mr. Machis, am I correct in concluding from your statement that it is the opinion of the engineers of the Washington Suburban Sanitary Commission that the present administrative organization and financial arrangements for dealing with the water problem in the Washington area, so far as the sanitary commission is concerned, are adequate?

Mr. MACHIS. Yes, sir; that is correct.

Representative HYDE. And that the present method of regulating the pollution and contamination, as far as health aspects are concerned, along the Potomac River and its tributaries in the Washington metropolitan area are adequate?

Mr. MACHIS. Yes, Mr. Chairman. I think that is correct. We feel that we have handled the pollution problem in the Maryland area cooperatively with adjoining jurisdictions, such as the District of Columbia, in a manner that is satisfactory to the area and at a cost which the people are able to fairly pay.

Representative HYDE. What is the commission's conclusion as to the reasons for the increased polluted condition of the river and its tributaries in the area? That is No. 1. No. 2, what do you suppose was meant when, in response to questions from this committee, the problem which was mentioned the most by all persons interrogated as being a most serious metropolitan-area problem was the water problem? Did you get the two questions?

Mr. MACHIS. Yes.

Representative HYDE. You might answer the first one first.

Mr. MACHIS. The first problem, relating to the increased pollution, Mr. Chairman—it is our feeling that this statement does not apply to the facts that exist in the Washington Suburban Sanitary District.

We have removed all pollution from the streams, with one exception, and are now conveying all of our sewage to the Blue Plains sewage treatment plant. The one exception is the Gaithersburg situation. In this area the Sanitary Commission owns and has operated for many, many years a secondary treatment plant which has put out a very good effluent. However, the capacity of the stream has been exceeded by the growth of this area, and the Commission is now in the process of constructing and completing plans for the balance of the construction, for the extension of an intercepting sewer at Rockville. This sewer will receive the pumped effluent from the Gaithersburg area. Consequently, the existence of this plant will no longer be necessary, and the pollution of the last remaining stream in our area will be removed.

Recently, the Commission constructed a trunk sewer in the Anacostia River, a sewage pumping station, and paid for the construction of a trunk sewer from the District of Columbia line to Blaine Street in the District of Columbia. It comprehends the completion of this line down to Poplar Point in the very near future. So that——

Representative HYDE. Well, you feel that your Commission has done all that can be done with respect to the pollution problem?

Mr. MACHIS. I would conclude that it has done a very fine job of cleaning up the pollution of the streams within the Washington Suburban Sanitary District.

Representative HYDE. Then does your Commission care to give any opinion as to the cause of the increased pollution in the Potomac? We have had legislators and statesmen rowing up and down the Potomac holding their noses, telling us what a terrible thing it is, and something has to be done right away. Now, what is the cause of this, what is causing that and what should we do?

Mr. MACHIS. Well, the cause of that, of course, is obviously the increased growth of population of the area, the increased organic loading on the Potomac River. I would submit that something is being done as far as we are concerned. We have joined with the District of Columbia in the enlargement of the treatment facilities within the District of Columbia, for which Maryland is paying its pro rata share. And so far it has paid several million dollars cash in advance of construction.

By virtue of our agreement, we anticipate that we will need to pay additional costs toward the completion of that treatment works.

I think on its completion, we will have contributed substantially toward the reduction of the organic loading on the river that is caused by sewage disposal from treatment works.

Representative HYDE. Then would you get to the next question. What do you suppose these people meant, these various government administrators and other officials in the area in response to questions from this Committee, where they mentioned water and its related problems as the most serious metropolitan area problem?

What is meant by that? In what way is it a problem?

Mr. MACHIS. I would conceive of the water problem as being principally one of quantity of raw water supply available to the metro-

politan area. There has been data presented in various publications which indicate that we are approaching the point when additional facilities must be made available for furnishing raw water to this area.

Specifically, the thing that Mr. Shaw has mentioned in his statement that would solve this problem would be the construction of a multiple purpose reservoir on the Potomac which would furnish the quantities of water necessary for water consumption of a domestic character in this area. Being a multiple purpose project, it would at the same time furnish dilution water which is so essential to the disposal of sewage effluent. This is true even though additional treatment may be provided.

It is brought about by the fact that the population is increasing, we anticipate it will continue to increase, and additional treatment will be necessary. At the same time, additional dilution will also be necessary to take care of this treated effluent.

Representative HYDE. You think these people, when they were talking about the water problems as being the major outstanding metropolitan area problem, they were thinking mostly about supply, and not the matter of regulation, control, and sewage treatment, and things of that sort?

Mr. MACHIS. When we speak of it, we think of it in those terms, Mr. Chairman, because we are preparing to furnish our area with additional treatment facilities, the pumping stations, transmission and supply mains that are necessary. We have a plan for doing this. We are in the process of implementing this plan by the necessary construction. So that within our area we have no problem which we feel we cannot handle insofar as treatment and distribution of adequate quantities of water to meet the needs of the area are concerned. We feel that there is a problem arising, as far as total amount of available raw water is concerned, available at the time when we need it.

Representative HYDE. Thank you, Mr. Machis.

Mr. Gutheim, do you have any questions?

Mr. GUTHEIM. I have no questions.

Representative HYDE. Mr. Levin?

Mr. LEVIN. Mr. Machis, could you sketch very briefly the history of the Washington Suburban Sanitary District?

Mr. MACHIS. Yes. The Sanitary District is a creature of the general assembly of Maryland. It was organized as a consequent of authority from the general assembly in 1918.

At the time of its organization, there were possibly 30,000 people residing within the 95 square mile area of the Sanitary District.

The general assembly has added to the boundaries of the District over a period of many years until now it includes an area of about 325 square miles, and we feel—we figure we are serving water to a population of 52,000 people.

This growth has occurred in the intervening 40-year period. The Commission has engaged in the construction of treatment plants, both water and sewer, on a stage basis. The first works were purchased from existing water companies, of which there were a number, with most of them having a magnitude of very, very few customers. The Commission purchased these systems, operated them until such time

as it could consolidate them by the construction of additional waterworks. For example, the system in Hyattsville was purchased. It was supplied by a well system. Shortly this well was abandoned. A treatment works was constructed in the area that we now use for our office building. Some years later this plant was abandoned when the treatment works at Burnt Mills on the Northwest branch was constructed, and this plant carried this area until relatively recent years.

When it became evident that the water needs were increasing beyond the capacity of this plant, the Commission proceeded to construct, by stages, a plant on the Patuxent River. The first stage of this plant was approximately 16 million gallons a day.

As water consumption increased, another stage of about the same quantity was added, and continued consumption required the Commission to add two more stages. The present capacity of the Patuxent plant is now 65 million gallons a day.

Mr. LEVIN. I don't think we need that great detail. However, would you generalize by saying that in 1918, when the Commission was formed, the suburban area was a pretty disjointed area in terms of water supply and sewage-disposal facilities, and that gradually the area, under the remarkable achievements of the Sanitary Commission, has been merged to the point where an excellent degree of service is rendered to upwards of half a million people.

Then your previous statement was that you did not believe that consolidation was necessary to achieve results which would enhance water supply and abate pollution. Don't you think that the Suburban Sanitary Commission, by its own example, is an argument that this consolidation paid great benefits in the Maryland area?

Mr. MACHIS. Well, I am sure we are flattered by being held up as an example of what can be accomplished in an area through agency of the type of Sanitary Commission. I think it has done a very good job, and there is no doubt that it is a regional agency of a kind. Its authority and its responsibility transcends county boundaries; namely, Prince Georges, Montgomery, Howard. It has authority to enter into agreements with Anne Arundel to supply the water needs of the area and the sewer needs of some of those areas, also.

I think by virtue of the fact that generally it is recognized that the Commission has done a good job of it, I can see no particular need for doing away with the existing arrangements and superimpose another organization on top of it. On the other hand, I cannot see where anything can be gained by superimposing another agency on top of the existing Sanitary Commission itself. It has cooperated and has received cooperation from its neighbors in the solution of problems to a mutual benefit.

Mr. LEVIN. I think I would like to take just a minute to read a paragraph from the report on water supply—from the report on sewage disposal and water pollution, because I think there has been a great deal of misinterpretation about what consolidation is. Consolidation does not necessarily mean a single supermetropolitan authority, nor was such recommend.

The paragraph reads, in terms of consolidation:

Perhaps this could best be accomplished by establishing a single sanitary authority for the entire Washington metropolitan area. Creation of one sanitary district to encompass the northern Virginia portion of the metropolitan area, and contractual coordination with the District of Columbia and the Washington

Suburban Sanitary District, might provide the best solution. Expansion of the functions and powers of the Interstate Commission on the Potomac River Basin to enable it to act as the authority or coordinating agency is another possibility.

So here are three, really four distinct possibilities, all of which are consolidation.

Now, do you think that the type of consolidation that has occurred in the Washington Suburban Sanitary District might be applied to the Virginia metropolitan region, or do you know of any particular reasons why this approach would not work there, and produce benefits similar to those in the Maryland area?

Mr. MACHIS. Well, we, of course, are delighted to be able to present a picture to this committee of the organization and the responsibilities of the Washington Suburban Sanitary Commission. I do not hold myself forth as the expert to tell the people of Virginia just how they should organize and how they should do their job. If upon consideration of the information which we can present to this committee it feels that it would like to hold up the type of organization that the Washington Suburban Sanitary Commission is to the people of Virginia, and say to them, "We recommend that you should do the same thing," we would be very highly flattered.

Mr. LEVIN. Mr. Shaw said that he thought public reaction would materialize so that within 10 years we would have a solution anyway, so that he saw no need of jumping the gun and promoitng a solution. Don't you think that the professional people in the area who have responsibility for water supply and sewage disposal ought to lead the public thinking rather than follow it?

Mr. MACHIS. Yes, I think that would be very commendable. I think they should, very definitely.

Mr. LEVIN. Thank you.

Representative HYDE. Well, Mr. Machis, the sanitary commission has no regulatory authority over health conditions—that is, pollution of the Potomac River, for example, that is not under your jurisdiction. That is under the Maryland State Department of Health, is it, or the Board of National Resources?

Mr. MACHIS. Mr. Chairman, what you say is not entirely correct, I think. I would like to tell you—perhaps you are not aware of this—that in 1955 the General Assembly of Maryland passed a law which requires anyone desiring to construct a water or sewage disposal system serving more than two or more homes to first submit its plans and specifications and engineering design data to the sanitary commission, and obtain from the sanitary commission a permit to construct these facilities.

In 1957 the General Assembly passed a similar law to cover Montgomery County, so that now these laws apply outside the sanitary district——

Representative HYDE. In the two counties?

Mr. MACHIS. That is correct. Any one wishing to construct these kind of facilities must obtain a permit from us. The regulations adopted by the Commission comprehend that we will review and approve the system in the ground and we will also review and approve the water treatment and the water supply, the sewage treatment and the sewage disposal.

Representative HYDE. Well, I recognize that, Mr. Machis. But take for example like an industry going—well, like the Pepco plant. Does the Commission, the Sanitary Commission, have any control over the water that they put back into the river?

Mr. MACHIS. No, sir.

Representative HYDE. That is the kind of control I am talking about. You don't have any control, in other words, over the contamination or degree of contamination of the waters by any——

Mr. MACHIS. Not by that kind of thing. The authority of the State department of health was maintained in that respect. We did not supersede them. We do have a certain degree of authority on treatment of pollution as made by subdivisions, groups of homes, things of that nature.

Representative HYDE. To that extent, you are subject to the regulation as to what you can put into the river by the State board of health?

Mr. MACHIS. Very definitely. We submit all of our plans to the State board of health.

Representative HYDE. And that is the only agency you are answerable to, as far as that is concerned. You don't have to submit it to the Public Health people, the United States Public Health people?

Mr. MACHIS. Oh, no.

Representative HYDE. Nor to anybody in Virginia, or the District of Columbia?

Mr. MACHIS. No, sir.

Representative HYDE. Do you have a question, Mr. Gutheim?

Mr. GUTHEIM. Yes. Dr. Machis, I am very much indebted to you for being here. I am sure you will recall yesterday that Robert Brown, who is chief of the bureau of environmental health of the Maryland State Department of Health, was testifying before us. I would like to read you several paragraphs from his statement, and to ask that when Mr. Shaw has returned from Texas, that you put your heads together and address us some considered statement that could be incorporated in the record by way of your comment on this.

Mr. Brown's paragraphs that I refer to you read:

> The point upon which I would like to dwell or the area is that in which we are greatly concerned at present, with preventing pollution of the Potomac and providing this pure source of water supply for the areas presently underdeveloped to the northwest of the District of Columbia. The areas of Montgomery County to the northeast of the Washington Sanitary District are in process of development. Pressures for residential housing in this area are increasing remarkably. I understand that this is similarly the case on the other side of the river in upper Fairfax County and in Loudoun County. The objectives in preventing pollution and in assuring an unpolluted source of water supply should be supplementary. I submit that at the present time the measures we have for assuring they both be carried out are almost mutually exclusive.
>
> In these areas, from the standpoint of sewage disposal, the water supply must come from the Potomac. The only place under present drainage patterns that sewage or treated sewage might be discharged is in the Potomac River. Following this pattern of treating sewage at several communities and discharging it to the river produces a question merely of time until the river in this same vicinity is, let us say, degraded from the standpoint of providing the kind of raw water source that we should desire for the demands of these communities and the existing areas. The problem then becomes ones of a plan which should be in existence at the present moment for permitting the development to take place while accomplishing the prevention of pollution and assuring a supply of water. We do not have such a plan.

Now, that is the point that I wanted to get a more detailed comment on than I think you might be prepared to make at this time.

Representative HYDE. For your purposes, that is on page 141 and 142 of the transcript of the testimony of yesterday.

Mr. MACHIS. I wonder if I might have a copy of that? To comment on that, I cannot wholly agree that we do not have a plan. The boundaries of the sanitary commission are established by the general assembly at their desire. We do not generally recommend that they be extended, and we merely transmit factual data to the general assembly to assist them in making up their minds on what they plan to do if they request such data.

Consequently, our area is governed entirely by the desires of the people as represented by their delegates at Annapolis.

Now, some of these areas are outside of the sanitary district. Of course, we have no immediate control over those areas other than the legislation which I previously discussed. For the areas which are inside the sanitary district, I believe we do have a plan for development. We have a 5-year program which was made in 1955, which comprehended the extension of trunk sewers up the various valleys of the sanitary district. It gave the year in which the commission proposed to do this construction, as well as the cost of the project and the cost to the consumer in the form of a rate for the construction of this prgram.

Recently, this program has been brought up to date for a 5-year period, starting now, it has been submitted to the commission for their consideration. It is now in that stage. It has not come out as approved yet.

So I feel that within the sanitary district we do have a plan, that we have followed the plan, that extensions have been made of various valleys of the sanitary district, notably the Cabin John Valley, the present construction in Rock Creek, and the proposed extension which will be completed by 1959, all the way to Gaithersburg.

It is to be noted that in accordance with this plan of extension and development, the sanitary commission will have opened up new areas which exceed the area of the District of Columbia—areas not presently developed and which are then available for development.

WASHINGTON SUBURBAN SANITARY COMMISSION,
Hyattsville, Md., May 20, 1958.

Mr. FREDERICK GUTHEIM,
Staff Director, Congress of the United States, Joint Committee on Washington Metropolitan Problems, Washington, D. C.

DEAR MR. GUTHEIM: Pursuant to a request at a meeting of the joint committee of the Congress to investigate problems of growth and expansion of the District of Columbia and its metropolitan area on April 23, 1958, Mr. Robert M. Brown, chief, bureau of environmental hygiene of the State department of health, and myself, met and prepared a statement relative to providing future water and sewerage facilities in the Montgomery County area north and west of the Washington Suburban Sanitary District.

Such statement is herewith enclosed and, as you will note, has been signed by Dr. Perry F. Prather, chairman of the State board of health, and Mr. T. Earle Bourne, chairman of the Washington Suburban Sanitary Commission. It was believed that the submission of this statement in this manner was the proper way to supply the committee with the information asked for.

Very truly yours,

HARRY B. SHAW, *Chief Engineer.*

JOINT STATEMENT BY THE MARYLAND STATE BOARD OF HEALTH AND THE WASHINGTON SUBURBAN SANITARY COMMISSION ON THE METHOD OF PROVIDING SEWERAGE FACILITIES IN THOSE VALLEYS IN MONTGOMERY COUNTY DRAINING TO THE POTOMAC RIVER BEYOND THE PRESENT LIMITS OF THE WASHINGTON SUBURBAN SANITARY DISTRICT

Pursuant to the request by Mr. Frederick Gutheim, staff director of the joint committee of the Congress of the United States to investigate problems of growth and expansion in the District of Columbia and its metropolitan area at a hearing of said committee on April 23, 1958, in Washington, D. C., the Maryland State Board of Health and the Washington Suburban Sanitary Commission jointly submit the following statement outlining the method of preventing pollution of the Potomac River and providing a pure source of water supply for the area presently undeveloped northwest of the District of Columbia.

It should be stated at the outset that primarily we have considered this matter as it applies to Maryland. It appears that the same procedure would similarly apply to the corresponding areas on the Virginia side of the river, but we feel it is proper for Virginia to speak for itself.

There is no doubt that there are pressures of considerable magnitude to bring about development in the tributary watersheds draining to the Potomac River northwest of Washington. We feel that these pressures to a great degree result from the location, the proposed location and, we understand, the probable future location of Federal institutions in this area. In our opinion there is no question but such location will have a great impact upon the development of these areas and will create major water supply and sewage disposal problems among others. We feel that it will be necessary eventually to construct sewers in various valleys to the Potomac River where the sewage flow will be collected in intercepting sewers which will be extended along the Potomac River to the District of Columbia line and then conveyed in District of Columbia sewers to the treatment plant at Blue Plains.

Obviously this construction cannot be financed locally, particularly the intercepting sewers along the Potomac River, and therefore we respectfully suggest that the Federal Government accept responsibility for financing the construction of such sewers along the Potomac River which are necessary to protect the water supply of Metropolitan Washington as a result of conditions which the Federal Government in part has helped to create.

We believe that it will be feasible to furnish water for the presently undeveloped areas northwest of Washington in Maryland by extensions of the water system of the Washington Suburban Sanitary District.

PERRY F. PRATHER, M. D.,
Maryland State Board of Health.
T. EARLE BOURNE,
Chairman, Washington Suburban Sanitary Commission.

Representative HYDE. Well, Mr. Machis, that suggests to me that you have a plan within the area under the jurisdiction of the sanitary commission. But is there an area plan or a basin plan that you know of?

Mr. MACHIS. No, sir; there is none that I know of, Mr. Chairman.

Representative HYDE. Thank you.

Mr. LEVIN. May I ask Mr. Machis one more question? In regard to the integration of the water supplies of the District of Columbia and the Washington Suburban Sanitary District, and the difficulties of topography, the map showing the outlines of the Washington Suburban Sanitary District around the District of Columbia might be cited. Now do you think that if we were starting at this time, that on the basis of the topography considerations, that very square line demarking the District of Columbia would be the natural separation of the two systems?

Mr. MACHIS. I think if you were starting now, you might conceivably do things a different way. But that is a figment of the imagination really—you are not going to start now. You have a multimillion dollar investment in existing facilities which I would

hardly recommend you ever consider abandoning and doing something else with. They are serving the population, serving them economically. And I think you have got to recognize that these things must be continued in service, and not substituted for by some other thing which conceivably you might do now that you know what has happened.

Representative HYDE. Well, Mr. Machis, do you consider that a bar to the area approach to regulation and control?

Mr. MACHIS. No; it may not be necessarily a bar to the area approach.

Representative HYDE. Is it a handicap?

Mr. MACHIS. No; it need not be a handicap. Anything that you come up with to be reasonable must take into account that these things exist and must utilize them as they exist. It need not be a handicap to the extension of these facilities in any way.

Representative HYDE. What I mean is: Do the existing physical facilities operate as a handicap to area control?

Mr. MACHIS. No; I think they do not. But what they do mean to me is that there are certain things that you can do and other things which you would not want to do, because you have existing facilities that were designed to do a job a certain way—you would not want to necessarily reverse yourself completely and do it some other way.

Representative HYDE. Of course, that is a matter of administration after you get the functional organization established, isn't it?

Mr. MACHIS. That is correct. I think so.

Mr. LEVIN. Looking at the map to the right, would you say that the considerable benefit of experience that you have alluded to in the Washington Suburban Sanitary Commission, and which you say would now be behind with respect to that commission, might not be applied to an area such as the one shown on the right where there are now 16 separate water supplies and all are in an infantile stage of development. Would this not be the time to benefit by the experience on the Maryland side?

Mr. MACHIS. Well, possibly that is true. I think it would be. As Mr. Shaw in his statement has stated, he would hesitate to tell them that they should adopt our system of doing things. But if this committee after due consideration of the testimony presented to it, should conclude to recommend to the Virginia people that they consider our type of organization and apply it to their own, we would be delighted to work with them and give them whatever information we have as to our experience.

Mr. LEVIN. Thank you very much.

Representative HYDE. We appreciate your coming down. At this time the Chair would like to recognize the presence of Senator Connolly.

Senator, we are very honored to have you present at our hearings this morning.

Senator CONNOLLY. Thank you very much.

Representative HYDE. Our next witness is Mr. Corbalis.

Will you state your full name and whom you represent for our record, please.

STATEMENT OF JAMES J. CORBALIS, JR., ENGINEER-DIRECTOR, CITY OF ALEXANDRIA SANITATION AUTHORITY

Mr. CORBALIS. My name is James J. Corbalis, Jr., engineer-director, City of Alexandria, Va. Sanitation Authority.

Mr. Chairman and gentlemen, we have a very brief statement to make, inasmuch as the views of the authority with respect to the staff committee report are contained in a joint statement to be later presented by Mr. Doe.

Our statement reads as follows:

The authority's views with respect to your staff report on sewage disposal and water pollution are contained in the joint statement of the northern Virginia communities to be presented to you by Mr. F. H. Doe, Jr., sanitary engineer, Arlington County, Va.

In addition, however, we should like to invite your attention to an error in the description of the type of the authority's sewage treatment plant appearing in the tabulation set forth on page 11. The type is designated as "intermediate," whereas it should be designated "secondary."

At present, this plant is the only one of the four major municipal plants in the metropolitan area in which secondary treatment is provided. Current and proposed programs envision that secondary treatment will be provided at each of the other three plants.

I am sure that was a typographical error. I know Mr. Levin is acquainted with the degree of treatment at that plant.

In addition to that statement, Mr. Chairman, if you desire, by virtue of my acquaintanceship with these problems over the past 17 years, and by reason of my attendance here yesterday, where there was very valuable information given with respect to the problem, I have made several observations which may be of help to the committee.

Time did not permit me to reduce them to written form. I shall be glad to do so later, if you desire. And if you would like to hear them, I will be pleased to present them.

Representative HYDE. We would, Mr. Corbalis. Would you proceed?

Mr. CORBALIS. Thank you. Under the heading of the scope of the problem, I do not believe that it would be naive and perhaps would be refreshing to suggest that they are not as many, or as complex, or as demanding of comprehensive remedial legislative attention as might be presumed.

This view is predicated upon the following factors or considerations.

Looking to the conditions that exist in the downstream section of the river—by that I mean downstream of the waterworks intakes, present and proposed—I think we would find the following to exist.

The completion of work in progress in the improvement of the District of Columbia treatment plant by the end of this year, coupled with the treatment-plant facilities already in operation in the northern Virginia communities, will result in reducing the total pollutent discharge in the downstream section of the river to a level well below the ability of the river to assimilate the discharge. According to population estimates, these facilities should be adequate to 1970 or later.

With respect to the upstream section, there are now, to my knowledge, no present discharges of untreated sewage which adversely affect the suitability of the river as a water supply. The present discharge of effluents from sewage-treatment plant located on the tributary streams do not now adversely affect the suitability of the river as a water supply.

There is an acute consciousness on the part of all concerned to see that the river is not adversely affected by either of these means in the future.

Evidence of this are the arrangements already existing between the District of Columbia and Maryland and those actively under consideration between the District of Columbia and Virginia whereby sewage is or may be conveyed to the District of Columbia system for disposal below the waterworks intakes.

The prohibition on the discharge of treated sewage into the river or its tributaries above the water-supply intake is certainly desirable but not, in my opinion, essential. To hold otherwise would be to disregard the many instances throughout the country where such is not the case and where there is no adverse effect on the water supply.

Under the heading of a plan of action for the future, I might state that we are on the threshold of the voluntary adoption of water quality objectives and criteria for the several sections of the river in the metropolitan area wherein there are differing intended water uses. This will simultaneously cast the die or set the mold for the kind of a river which is desired and the nature of its pollution abatement programs which will be required in each of the several political subdivisions.

It is difficult to imagine that the sincerity with which these objectives are being mutually proposed by the local government will result in other than an equal sincerity to achieve the objectives.

The proposal of these objectives and the expenditure of approximately $58 million in the current decade by these governments for a pollution abatement program has occurred in the absence of any single administrative functional or regulatory agency. It is not unreasonable to suggest that the toughest part of the battle is over, that of catching up and getting ahead, if only slightly, in the pollution abatement field. With continued diligence there is no reason why these same governments cannot apply the experiences of the past, particularly those of cooperative contractural programs, to solving the problems of the future. Problems should, in fact, be more clearly defined by the very existence of mutually agreeable objectives.

The apethetic or recalcitrant members of the metropolitan area family, if there should be any, should be more easily and effectively subjected to enforcement power now properly vested in the local and State governments by the existence of these objectives.

The Interstate Commission on the Potomac River Basin, assisted by the Corps of Engineers and other interested agencies, should occupy a more prominent, if not central focal point in the future of the pollution abatement in the area. It is in urgent need of additional funds to either initiate or enlarge programs for continuing studies on the assimilative capacity of the river, stream sampling and analysis, educational and public relations programs; these are the tools which all of the governments now need and will continue

to need to create a public awareness and acceptance of proposals requiring substantial capital outlay.

In other words, the Commission can be the watchdog of progress and assure intergovernmental conformity.

On the subject of Federal responsibility, which was discussed on yesterday, there seems to me to be two principal factors upon which a case for recognition of Federal responsibility in the pollution abatement of the metropolitan area must rest. These are first the impact of Federal installations and consequent satellite development; and second the National Capital City.

With respect to the impact of the Federal installations, except as the exigencies of a national emergency should require, there should be no excuse for locating any permanent Federal installation in an area where disruptions of orderly growth and development patterns are the obvious or likely result. The problems for which I do not have a suggested solution seem to me to lie wholly in the field of regional and local planning.

Remedial legislative action may be indicated on the basis of recent past experience. Assuming, however, the proper location of such an installation, the resulting pollution-abatement problems, both as to the installation and the satellite development, are in fact the same as those which would be brought about by the entry of a comparable-sized industrial, commercial, or other nongovernmental installation.

A vital ingredient for the solution of the problems, however, is missing. That is the taxable value of the installation itself. One solution for this may be a Federal contribution in lieu of taxes. Another is a Federal grant in aid, precedents for which exist with respect to Federal aid for education in federally impacted areas.

A secondary problem may arise with respect to the rapidity with which the satellite developments come into being and require sewage-disposal service. If the rate exceeds the ability of the local government to finance the initial capital outlays, a solution might well include a Federal interest-bearing loan or provision for Federal guaranty of payment of part of the funds required to be raised by the local government.

Turning to the National Capital City aspect, the prevailing philosophy with respect to the establishment of water-quality objectives and criteria for the Potomac River is that because we are concerned here with a National Capital City, there should be a higher plane to which we should aspire.

This is evident in the objectives and criteria which have been proposed. To the extent that expenditures may be required by the local governments over and above those which would be required if the National Capital City were located elsewhere, it is my opinion that this should be the direct and sole responsibility of the Federal Government.

Whether, for example, the residents and taxpayers of California or Ohio, Maine or Florida, or all of the other States are willing to contribute to the support of this kind of a river is not for me to answer. But, as a resident and taxpayer of the metropolitan area, I do not incline toward the view that the metropolitan area should be solely responsible for this support.

One form of solution, if the higher plane philosophy is to be accepted, would be for Federal grants-in-aid for the defrayal of the extra costs to be incurred by the local government.

As a concluding statement, in substance, there is, in my opinion, no case for a single administrative functional or regulatory agency under existing circumstances. Federal financial assistance would be very effective in two instances. That is, the broadening of the programs of the Interstate Commission on the Potomac River Basin, and, second, relieving the local governments in situations where there is a direct Federal responsibility.

Thank you, sir.

Representative HYDE. Thank you very much, Mr. Corbalis. That is a very excellent statement and will be very valuable to the committee.

Let me ask your opinion on this:

Do you think that the present method of cooperation—that is, enforcement by cooperation along the river—can survive the impact of future development about which we heard yesterday, but of which we have heard and read much in the press?

For example, some testimony that we have already before the committee and also reports that we have had indicate the doubling of this area, say by the year 2000—the population. We have heard that that is going to happen—that the area will be more highly industrialized, which means that there is going to be a greater competition for location of industries between the political jurisdictions than there has been in the past.

Now, the history of other areas throughout the country, where you have had that impact of industrialization, and the competition for it has shown that the segregated method of enforcement has not been effective. At least there has been evidence of it in a number of places, if not most every place where that sort of impact has taken place.

So if the area, the community, is going to be faced with that sort of an impact within the next several generations, do you feel that our present enforcement methods are adequate to deal with it and to protect us against future pollution?

What we would like to do now is to try to prevent any worse conditions or the repetition of the conditions that we are now facing within the Potomac River.

Mr. CORBALIS. It is my view, Mr. Chairman, that the present methods, modified to some extent—and I will cite those in a moment—would be sufficient. I predicate that on the grounds that there is now, as there never has been before, a very acute public awareness, not only of the problem—that is understandable—but of what needs to be done in terms of money to finance the various remedies. So long as we can maintain that public awareness, I have no fear of the future.

An example of it would be the situation in the city of Alexandria. We were once one of the recalcitrant members of the metropolitan area family, if you choose to label it as such. For years there was no inclination whatsoever to provide for pollution abatement. But shortly before the actual decision was reached to proceed in that direction, there did become, in the area as a whole, this public awareness which I mentioned. And there was no difficulty, on the part of the powers that be in the city government and others, to sell the

public the idea that something should be done and it would cost X dollars to do it.

I feel that if the facts are made known continuously to the people, through an agency such as the Interstate Commission, they can be kept up to date, that there will be no reason why the public will not support the programs.

If the voluntary method of setting standards or objectives the voluntary agreement to accomplish them, should happen to fail or show indications of failure, then I would suggest that it would be modified to this extent—that the Interstate Commission take the leadership, as representing the several interests in the metropolitan area, to formulate what we do desire in the way of pollution abatement for the metropolitan area, and to seek the official approval of those by the several States that are involved. Once that has been done, the law prevails, and I can see no reason why it should not be successful.

Representative HYDE. Do you feel that the Interstate Commission should then broaden its planning program?

Mr. CORBALIS. Correct.

Representative HYDE. But not be given any additional authority as far as regulation is concerned?

Mr. CORBALIS. Correct. To my knowledge, the Commission, in all of its splendid work to date, has not had—whether it asked for it or not I am not certain—has not had a stamp of approval by the States of Maryland and Virginia and the District of Columbia, as to what it wants done in the metropolitan area. I don't think it is necessary, so long as there is this feeling of voluntary endeavor.

Representative HYDE. I assure you it has not asked for anything additional.

Are there any questions, Mr. Gutheim?

Mr. GUTHEIM. No questions.

Representative HYDE. Mr. Levin.

Mr. LEVIN. Yes. First I would like to apologize for misstating the case of Alexandria, sewage treatmentwise. It was not a typographical error, but an error in my interpretation of discussing the matter with you. I am glad you set the record straight.

I would also like to ask you if you would send to the committee a copy of your very excellent report on the operations of the Alexandria Sanitary Authority. I think that the brief history of the authority, as well set forth in the report, indicates that it has been a considerable success.

In terms of the philosophies that we have been discussing yesterday and today, of multiple sewage discharges versus consolidation and single or few discharges, I am sure you are thoroughly familiar with the background behind the decision of the Virginia communities in 1954 to go ahead on the basis under which they have made such excellent progress.

Would you believe that the financial considerations in terms of costs, as estimated at the time, were sufficient to warrant the choice that was made on an economic basis. Now, the choice I am talking about is the choice of the public of the sewaging from much of the northern Virginia area to the District of Columbia, plus the outlying treatment plants that would be needed in Virginia, versus the in-

dividual approach, the difference being in the order of a little more than $1.3 million out of a total of $55 million, which was the price of the selected plan.

Mr. CORBALIS. I should be glad to comment on that, Mr. Levin, but in doing so I think I would infringe on the area of Mr. Doe's testimony representing the several communities. I think, however, I can safely make this statement: That in my opinion, at the time the decision was made, it was premised on not only the economic consideration, but on what was necessary to protect the river, and "protect the river" would include public health aspects.

Mr. LEVIN. Well, I did not see any reference to public health in the reports that were supporting this decision. Since then, I have had occasion to discuss the public health matter with several of the health officers in the area, who were invited to testify here, and I did not come to the conclusion that public health was even a consideration in this decision. Can you please explain the public health benefits of the discharges of sewage to multiple streams versus the carrying of the sewage away from the populated area?

Mr. CORBALIS. I think it is implied, with particular reference to the major plants on the downstream section of the area, in the capacity of the area to assimilate without resulting in nuisance or public health menace—without actually saying so. With respect to the isolated plants in other areas of northern Virginia, again, that to me is implied in the character of the stream to which the discharge is made and the capacity of the stream to assimilate that discharge.

Mr. LEVIN. Do you think, then that under the progress that has been made with this plan, that streams such as Pimmit Run, Four-Mile Run, Hunting Creek, Little Hunting Creek, and many of the others are now satisfactorily protected against pollution and are not in fact now polluted?

Mr. CORBALIS. I don't think the answer could be made generally. I think we would have to consider each stream in itself, and there are several of them of which I have personal knowledge of the situation. With respect to Little Hunting Creek, I do not consider it to be polluted at the present time—that is polluted from the standpoint of our discharge of treated effluent into the stream. And there are to my knowledge no discharges above that point.

Mr. LEVIN. Then you do say that cost was not or should not have been a predominant factor in the decision of the method by which sewage should be disposed?

Mr. CORBALIS. I think that the term cost would comprehend a satisfactory objective. The objective certainly includes public-health protection.

Mr. LEVIN. What I am driving at is that these cost estimates only varied by 10 percent in a projected cost to the year 2000. Now, as an engineer, wouldn't you say that it would be remarkably accurate to be able to estimate costs to such a degree?

Mr. CORBALIS. Yes, sir.

Mr. LEVIN. Cost would not be a major factor in this decision?

Mr. CORBALIS. That is right.

Mr. LEVIN. Mr. Corbalis, your sanitary authority deals only with sewage disposal, is that correct?

Mr. CORBALIS. That is correct.

Mr. LEVIN. Do you know of any reasons why your sanitary authority could not also handle the water supply problem in the area, as is customary in many sanitary authorities, and I might add refuse disposal as well?

Mr. CORBALIS. There is no reason. Legislatively speaking we are empowered to enter into those projects when the occasion arises that would dictate that as a proper solution.

Mr. LEVIN. Are you also empowered to expand the boundaries of the sanitary district?

Mr. CORBALIS. Yes, sir; upon approval of the governing bodies of the particular jurisdictions that are involved.

Mr. LEVIN. But the framework is set up?

Mr. CORBALIS. Yes, sir.

Mr. LEVIN. Do you see any possible benefits or any liabilities in expanding the boundaries of the sanitary authority, Alexandria Sanitary Authority, to the point where it would encompass a large or the major portion of the developed area in Virginia, in the metropolitan area?

Mr. CORBALIS. I see no advantage or benefits to be received from expansion insofar as sewage disposal matters are concerned.

Mr. LEVIN. How about insofar as water supply?

Mr. CORBALIS. As far as water, I don't believe that a definitive answer can be given for the reason that, as you well stated in the report, that there are a great number of suppliers, many different operating agencies, of which Alexandria is only one, it happens to be the largest one. Within the framework of the law, it can be done.

Mr. LEVIN. Referring again to the map of sewage discharges, the red dots showing the treatment plants and discharges, do you believe that if the Alexandria Sanitary Authority were extended or created to encompass an area similar to that, say, on the Maryland side, encompassing most of the population of the metropolitan area—do you believe that the future would hold a continuation of the construction of individual plants and would the great number of individual plants survive or would they gradually consolidate?

Mr. CORBALIS. I should think the pattern would pretty much follow the experience that has happened in the Washington Suburban Sanitary District and elsewhere in the metropolitan area, that over a period of time, depending on the development of growth and the particular location of the development, that individual plants would become part of the consolidated system.

Mr. LEVIN. Well——

Mr. CORBALIS. And that has actually been the experience, to a limited extent, in northern Virginia.

Mr. LEVIN. But there is no plan in northern Virginia at the time designed toward this end?

Mr. CORBALIS. No, sir.

Mr. LEVIN. Thank you very much.

Representative HYDE. Thank you very much. We appreciate your testimony.

(The statement of Mr. Corbalis is as follows:)

STATEMENT OF JAMES J. CORBALIS, JR., ENGINEER-DIRECTOR, CITY OF ALEXANDRIA, VA., SANITATION AUTHORITY, REGARDING SEWAGE DISPOSAL AND WATER POLLUTION PROBLEMS

INTRODUCTION

This statement supplements the views of the city of Alexandria, Va., sanitation authority, and briefly summarizes the personal observations of the speaker which have materialized as a result of an acquaintanceship with the sewage disposal and water pollution problems of the Washington metropolitan area during the past 17 years, as they relate to the current considerations of the joint committee and the testimony thus far presented at its public hearing. I trust that these observations will be helpful to the committee in its deliberations.

SCOPE OF PROBLEMS

It is not naive, and perhaps refreshing, to suggest that the sewage disposal and water pollution problems are not as many, not as complex, or not as demanding of comprehensive, remedial, legislative attention as might be presumed. This view is predicated upon a consideration of the following factors.

DOWNSTREAM SECTION OF THE POTOMAC RIVER—FROM KEY BRIDGE TO HALLOWING POINT

The completion of the work in progress toward the improvement of the District of Columbia treatment plant facilities by the end of this year, coupled with the treatment plant facilities already in operation in the northern Virginia communities, will result in reducing the total pollutant discharge in the downstream section of the river to a level well below the ability of the river to assimilate the discharge. According to population estimates, these facilities should be adequate to 1970 or later.

UPSTREAM SECTION OF THE POTOMAC RIVER—FROM MONOCACY RIVER TO KEY BRIDGE

There are no present discharges of untreated sewage which adversely affect the suitability of the river as a water supply. The present discharges of effluents from sewage treatment plants located on the tributary streams do not adversely affect the suitability of the river as a water supply. There is an acute consciousness on the parts of all concerned to see that the river is not adversely affected by either of these means in the future. Evidence of this are the arrangements already existing between the District of Columbia and Maryland, and those actively under consideration between the District of Columbia and Virginia, whereby the sewage is or may be conveyed to the District of Columbia System for disposal below the water intakes. A prohibition on all discharges of treated sewage into the river or its tributaries above the water supply intakes is unquestionably desirable—but not essential. To hold otherwise would be to disregard the many instances throughout the country where such is not the case and where there is no adverse effect on the water supplies.

PLAN OF ACTION FOR THE FUTURE

We are on the threshold of the voluntary adoption of water quality objectives and criteria for the several sections of the river in the metropolitan area wherein there are differing intended water uses. This will simultaneously cast the die, or set the mold, for the kind of a river which is desired and the nature of the pollution abatement programs which will be required in each of the several political subdivisions. It is difficult to imagine that the sincerity with which these objectives are being mutually proposed by the local governments will result in other than an equal sincerity to achieve the objectives. The proposal of these objectives, and the expenditure of approximately $58 million in the current decade by these governments for pollution abatement programs, has occurred in the absence of any single administrative, functional or regulatory agency. It is not unreasonable to suggest that the toughest part of the battle is over—that of catching up and getting ahead, if only slightly, in the pollution abatement field. With continued diligence there is no reason why these same governments cannot, or will not, apply the experiences of the past, particularly those of cooperative contractual programs, to solving the problems of the future.

The problems should, in fact, be more clearly defined by the very existence of mutually agreeable objectives. The apathetic or recalcitrant members of the metropolitan area family, if there should be any, should be more easily and effectively subjected to the enforcement powers now properly vested in the local and State governments by the existence of these objectives.

The Interstate Commission on the Potomac River Basin, assisted by the Corps of Engineers and other interested agencies, should occupy a more prominent, if not the central focal, part in the future of pollution abatement in the area. It is in urgent need of additional funds to either initiate or enlarge programs, among others, for continuing studies on the assimilative capacity of the river, for stream sampling and analysis, and for educational and public relations activities. These are the tools which all of the local governments now need and will continue to need to create a public awareness and acceptance of proposals requiring substantial capital outlays. In other words, the Commission can be the watchdog of progess and the insurer of intergovernmental conformity.

FEDERAL RESPONSIBILITY

There seems to me to be two principal factors upon which a case for recognition of Federal responsibility in pollution abatement matters in the metropolitan area must rest, i. e.,

(1) The impact of Federal installations and consequent satellite development, and

(2) The National Capital City.

IMPACT OF FEDERAL INSTALLATIONS

Except as the exigencies of a national emergency should require, there should be no excuse for locating any permanent Federal installation in an area where disruptions of orderly growth and development patterns are the obvious or likely results. The problem, for which I do not have a suggested solution, seems to me to lie wholly in the fields of regional and local planning. Remedial legislative action may be indicated on the basis of recent past experience. Assuming the proper location of such an installation, the resulting pollution-abatement problems, both as to the installation and the satellite development, are, in fact, the same as those which would be brought about by the entry of a comparable size industrial, commercial, or other nongovernmental installation. A vital ingredient for solution of the problems, however, is missing—that is, the taxable value of the installation. One solution for this is a Federal contribution in lieu of taxes—another is a Federal grant-in-aid, precedence for which exists with respect to Federal aid for education in federally impacted areas. A secondary problem may arise with respect to the rapidity with which the satellite developments come into being and require sewage-disposal service. If the rate exceeds the ability of the local government to finance the initial capital outlays, a solution might well include a Federal interest-bearing loan or provision for Federal guaranty of payment of part of the funds required to be raised by the local governments.

NATIONAL CAPITAL CITY

The prevailing philosophy with respect to the establishment of water-quality objectives and criteria for the Potomac River is that, because we are concerned here with the National Capital City, there should be a higher plane to which we should aspire. This is evident in the objectives and criteria which have been proposed. The extent to which expenditures may be required by the local governments over and above those which would be required if the National Capital City were located elsewhere is, in my opinion, the direct and sole responsibility of the Federal Government. Whether, for example, the residents and taxpayers of California, Ohio, Maine, and Florida and all of the other States, are willing to contribute to the support of this kind of a river is not for me to answer, but as a resident and taxpayer of the metropolitan area, I do not incline toward the view that the metropolitan area should be solely responsible for the support. One form of solution, if the higher plane philosophy is accepted, would be Federal grants-in-aid for the defrayal of the extra costs incurred by the local governments.

CONCLUSION

In substance, there is, in my opinion, no case for a single administrative, functional, or regulatory agency under existing circumstances. Federal financial assistance would be very effective in two instances, i. e.:

(1) Broadening the programs of the Interstate Commission on the Potomac River Basin;

(2) Providing relief for the local governments in situations where there is a direct Federal responsibility.

Representative HYDE. Mr. Doe, do you have a statement you were going to submit at this time?

Mr. DOE. It won't take but a few minutes.

Representative HYDE. All right, sir. Will you state for the record your name and whom you represent?

STATEMENT OF F. H. DOE, JR., SANITARY ENGINEER, ARLINGTON COUNTY, VA.

Mr. DOE. My name is F. H. Doe, Jr. I am a sanitary engineer, Arlington County, Va. And this is a statement to the joint committee from Arlington County, Fairfax County, and the Alexandria Sanitation Authority.

I speak for the three staff members of those jurisdictions with relation to sewage disposal—Mr. Corbalis, Mr. Hale, and myself.

We have read with interest the staff report prepared for the joint committee on Washington metropolitan problems on sewage disposal and water pollution in the Washington metropolitan area.

The staff report refers to an engineering study made in 1954 relating to sewage disposal for the metropolitan area of northern Virginia, encompassing Arlington County, Fairfax County, Alexandria, and Falls Church. The soundness of the two principal conclusions of this study are questioned in the staff report. These are (*a*) the pollution assimilation capacity of the Potomac River and (*b*) the number and location of sewage treatment plants in the northern Virginia area.

Our comments with respect to these matters are as follows:

(*a*) Pollution assimilation capacity: The pollution assimilation capacity of 120,000 pounds of biochemical oxygen demand per day as determined in the 1954 study is supported by the records of stream analyses.

This determination was accepted for computation of treatment requirements in the 1957 Wolman report to the Interstate Commission on the Potomac River Basin.

So far as we know, no figure materially different from this one is supportable. By that I mean engineeringwise.

(*b*) Number and location of treatment plants. With respect to the number and location of sewage treatment plants, the studies and conclusions of the northern Virginia report are sound and supportable. We feel that the report was prepared by competent engineers and that the studies and conclusions are unbiased and thorough.

We believe that comparably thorough and adequate studies undertaken by other competent and unbiased engineers would not alter the basic conclusions.

The assumption in the staff report that all of the sewage from the northern Virginia area should be treated at one location is in our opinion without due economic consideration or adequate study. No such conclusion, in our opinion, is warranted. Nor would this conclusion, of necessity, be the case if the entire area were under the jurisdiction of a single authority. Examples of sound, overall projects involving more than one treatment plant to serve metropolitan areas include the following—and there is a rather lengthy list where there are from 1 present and 1 future plant to as many as 12 and 14 present and future plants. I don't think I need to read that list, unless you would like to have it read?

Representative HYDE. Do you have any information as to the efficiency or the economy of the operation in the different areas? The figures themselves alone mean nothing unless you know something about what benefits are being derived from them.

Mr. DOE. Well, no, not specifically. I am sure that all of these plants were built in as economical a manner as possible, that all of the many factors of transportation as well as treatment were taken into account. By that I mean in large metropolitan areas it is apparent—to me—that it is in some instances more economical to have two plants than one large plant with an exceptionally long interceptor sewer of very high cost. And I believe that is the reason why most of these cities—New York, Boston, Philadelphia, and so on—have gone to 2 or 3 or 4 or more major plants.

Representative HYDE. How many different plants do you have now in that part of the metropolitan area which is in Virginia?

Mr. DOE. I don't have that figure with me. But——

Representative HYDE. Can you roughly guess it at the moment?

Mr. DOE. If I can ask Mr. Hale how many there are in Fairfax. Could you tell me that, Mr. Hale, offhand?

Mr. LEVIN. Some of these communities have 2 or 3 plants, so you would have to read under "Remarks" in the report to get the total.

Representative HYDE. Well, what is the approximate number you have in that area?

Mr. HALE. Approximately 14, sir, in the immediate area.

Mr. DOE. Is that in northern Virginia?

Mr. HALE. That is including Arlington and Alexandria.

Representative HYDE. Serving a population of how many?

Mr. DOE. About 350,000, I think.

Representative HYDE. Well, according to your figures here you have got—these examples you have cited from other cities—you have cities which I recognize as ranging all the way from half a million to a million—most of them ranging from 1 to 5 plants, and only 1 with more than 5.

Mr. DOE. I see what you are driving at, and your point is well taken. That is, that there are admittedly an excessive number of plants, particularly in Fairfax County. It comes down to the economics of the situation. With a very large area, scattered development, the excessive cost at this time of building interceptor sewers to all of those places where there ought to be new plants would be, I would guess, financially impossible for the county to handle. Of course, I am speaking in the wrong jurisdiction. I should let Mr. Hale be saying this.

Representative HYDE. Well the area certainly is no larger than the Chicago sanitary district.

Mr. DOE. There you are comparing a sparsely built-up area with a very tightly built-up area.

Representative HYDE. All right, sir. You may proceed.

Mr. DOE. Where uncertainties exist with regard to the magnitude and location of future development, particularly in an area which is subject to extreme and unpredictable growth patterns, flexibility of a sewerage plan is a prime requisite. This advantage is inherent in the multiple-plant program.

In conclusion, we would like to emphasize the fact that within the last 5 or 6 years most of the jurisdictions in the Washington metropolitan area have either constructed or are now constructing sewage treatment works which will have the cumulative effect of greatly reducing the pollution in the Potomac River and that the total pollution loading imposed on the river in the future will be kept well below the river's ability to assimilate such pollution as a result of the continued implementation of the presently proposed pollution-abatement programs of the various jurisdictions.

That ends my statement, sir.

Representative HYDE. Thank you very much, Mr. Doe.

Are there any questions?

Mr. LEVIN. I would like to ask several questions. Regarding this matter of the pollution assimilation capacity of the Potomac River, which was not, incidentally, one of the questions that the report raised with specific regard to the northern Virginia area, are you familiar with Dr. Charles Wren, of the Johns Hopkins University?

Mr. DOE. Yes, sir.

Mr. LEVIN. He is an eminent authority in stream pollution

Mr. DOE. Agreed.

Mr. LEVIN. Are you familiar with the report made to the Potomac River Commission in 1954 in which he said as referenced in this sewage disposal report that the criteria for assimilating sewage in the metropolitan area, the Washington metropolitan area, of the Potomac River, is not suitable, and that no reliable figure for the assimilative capacity of the river is presently known, and he strongly recommended that a study be made?

Mr. DOE. I don't remember the exact statement in Dr. Wren's paper, except I would like to say that I think he took into account the siltation problem which in our opinion is the big problem of the area, and should be faced immediately.

If I might add another statement along that line—it seems to me that if Congress would presume to take some action on this matter, that it should be directed toward the solution of that silt problem by the construction of a dam at the River Bend or some other substitute so that the pollution problem can be viewed in its proper perspective. That is, the ability of the river to assimilate pollution has been greatly handicapped by the heavy silt loading which continues to come down.

Representative HYDE. Well, you don't suggest that that is going to be solved by a dam, do you?

Mr. DOE. Partially by a dam.

Representative HYDE. That will hold the silt above the dam, but that won't——

Mr. DOE. It would mean, of course, that the dam would fill up unless conservation measures were taken upstream.

Representative HYDE. Isn't it more important in connection with this silt problem which you cite as one of the major problems as far as the river is concerned, is the matter of regulation at the local level, planning and conservation practices?

Mr. DOE. Exactly, sir.

Mr. LEVIN. You say that the assumption in the staff report that all sewage from the northern Virginia area should be treated at one location is without due economic consideration or adequate study. I do not find such an assumption in the staff report, and I believe this has been a misinterpretation. I would like to read the paragraph that does discuss this. This is page 19 of the sewage disposal report, under the heading of "Gradual consolidation."

> It is not suggested that the costly works recently built in the Virginia region of the metropolitan area be summarily abandoned in favor of immediate consolidation and delivery of sewage for essential treatment and discharge to the Potomac. However, it is suggested that the situation be further explored to see whether a planned transition which would gradually consolidate the systems as segments become overloaded might be feasible.

Do you take issue with that statement?

Mr. DOE. I do not. But earlier in the paper the implication has been made on page 15 of the paragraph entitled "Consolidation Rejected"—we felt that the thought was that we had for all time rejected the idea of getting together. Such is not the case in my opinion, in northern Virginia. It should be mentioned, for instance, that Arlington treats sewage at the moment from part of Fairfax County and part of the city of Falls Church and part of Alexandria. We have had working agreements for many years on that score. And, of course, you are familiar with the Alexandria and Fairfax arrangement.

Mr. LEVIN. Under this heading, "Consolidation Rejected," does it state anywhere that it is assumed or recommended that all sewers be discharged at a certain central point?

Mr. DOE. Not in so many words. I have to agree it does not.

Mr. LEVIN. I can't even find the implication. Would you support Mr. Corbalis' statement that in terms of cost alone there was not sufficient difference in the plans to elect a particular plan on the sole basis of cost?

Mr. DOE. I would agree with Mr. Corbalis.

Mr. LEVIN. What, in your opinion, is the primary reason for disposing of sewage?

Mr. DOE. So as to prevent a public health nuisance.

Mr. LEVIN. Public health?

Mr. DOE. Yes.

Mr. LEVIN. Do you know of any reports from any of the health officers in the area which recommend the individual disposal system that was adopted, or of any instances which these health officers were formally requested for their opinion?

Mr. DOE. Only indirectly; in that, in each case as a sewage treatment plant was constructed in Virginia the matter was referred to the State board of control, and they in turn secured the advice of the State department of health. We look to them; they are the

regulatory agency which controls us. And in each case approval has been given.

Mr. LEVIN. This was after the fact that the system has already been adopted, and this did not involve the local health officials of the area?

Mr. DOE. You are speaking now of the multiple plant setup?

Mr. LEVIN. Yes.

Mr. DOE. Well, of course, the State has been aware all the time that these different plants were being constructed, and they have seen fit to approve each one.

Mr. LEVIN. But they did not participate in the decision?

Mr. DOE. To locate a particular plant?

Mr. LEVIN. No; to treat sewage at numerous plants and discharge to small streams.

Mr. DOE. I don't know as I can answer that exactly. I would say that they certainly must have considered that when they gave approval to the several plants in northern Virginia.

Mr. LEVIN. There is just one quote here which is attributed to you, which I would like you to clarify, if possible. This is taken from a report, Defining Procedure for Scheduling Expansion of Sewage Works for Disposal of Sewage on Pimmit, Little Pimmit, Dead Turkey, Scott, and Bull Neck Run, McLean, Va.; Fairfax County, August 28, 1957, by G. Hubert Massey, consulting engineer.

"Joint policy with Arlington County," page 2:

> In March of 1955, Mr. Harry Hale, sanitary engineer for Fairfax County, Va., and Mr. F. Harry Doe, Jr., assistant sanitary engineer for Arlington County, jointly prepared a report containing a long-range plan for sewage service for lower Pimmit Run watershed. The authority for this report was based on the action of boards of county supervisors of both Fairfax and Arlington Counties in 1948 and again in 1952. The former was the approval of a joint policy for water and sewage service. The latter was the adoption of procedures, regulations, and charges to further implement the policy.

The report of Messrs. Hale and Doe contained the following:

> The basic premise of the plan is to treat the sewage as close to its point of origin as possible consistent with topographic conditions. Upper Pimmit Run treatment plant, called Bryan Branch report, is about as far downstream as it is possible to go and still find a large enough tract of land for the economical construction of a plant.

Is that a true statement of the premise of sewage treatment in the northern Virginia area?

Mr. DOE. That is rather a leading question, Mr. Levin. We are speaking there of a limited watershed—that is the Pimmit Run watershed—and that would not necessarily be a policy for the local area. In partial answer to your question, the matter of economics enters the picture again on your Pimmit Run—there is a rather extended area of a type of gorge condition, where development is not readily—cannot readily take place. The upper end of the watershed is developed, and the county, as I understand it, just could not afford to, at that time, extend the trunk sewer a considerable distance, such as is now contemplated going across the river into the District system.

Does that answer your question?

Mr. LEVIN. Well, just one final question. Do you believe that if the Virginia metropolitan area were consolidated into a sanitary authority that the number of sewage-treatment plants would increase, remain constant, or decrease in the future?

Mr. DOE. Well, I certainly think they will decrease. I think they would decrease in any case. The Fairfax board of supervisors has on several occasions indicated that to be their policy, as I understand it, and they hope over a period of time to eliminate many of these small, unsatisfactory plants.

I can't see that any overall authority would speed that up appreciably.

Mr. LEVIN. Then how do you account for the fact that this was apparently speeded up in Maryland, where there was such an overall authority?

Mr. DOE. Because the authority was set up at a time before the large population growth occurred. It has happened in Fairfax. Of course, it will continue to happen. There is no question about that.

Representative HYDE. Aren't we every day on the verge of a new great population growth? In other words, isn't it probable that we are small now compared to what we will be in 2000?

Mr. DOE. Oh, certainly, yes, sir.

Representative HYDE. All right.

Mr. LEVIN. Thank you very much.

Representative HYDE. Thank you very much, Mr. Doe.

Our next witness is Mr. Thompson, representing I believe the Washington Board of Trade.

For our record, would you state your full name and whom you represent.

STATEMENT OF JOHN W. THOMPSON, CHAIRMAN, COORDINATING COMMITTEE ON THE FUTURE OF WASHINGTON, WASHINGTON BOARD OF TRADE

Mr. THOMPSON. Mr. Chairman and gentlemen, I am John W. Thompson, chairman of the coordinating committee on the future of Washington of the Washington Board of Trade. I am authorized by the board of directors to appear here and present these views this morning.

It would perhaps be informative to the members of the committee if I took just a moment to explain the functions and objectives of the coordinating committee.

Since the end of the World War II the Washington Board of Trade has become increasingly concerned with the growth problems of the Nation's Capital. To coordinate the work being done by a number of our committees, the board of directors established the coordinating committee on the future of Washington about 3 years ago.

To insure consistency of policy, findings and recommendations respecting needed community facilities emanating from our committees on public utilities, transportation, community planning, downtown Washington, economic development, the Federal Government establishment, urban renewal and redevelopment, and zoning are reviewed and coordinated by this committee before being transmitted to the board of directors for final action.

Since last autumn the coordinating committee has been assembling data to portray the Washington community of the year 2000. This report is being prepared on instructions from the board of directors in the belief that it will equip us better to make sound determinations

concerning the scope and magnitude required in a great many community facilities under discussion and the types of public agencies needed to plan and operate them in this rather complex metropolitan Washington area.

Our staff has been making population trend studies, employment forecasts, and developing related material. At the appropriate time we will be very happy to furnish such data to the committee.

We have not yet formulated conclusions respecting the details of the manner in which metropolitan area services should be rendered. We have a reasonable familiarity with existing agencies. We are studying steps taken to solve metroplitan area problems in Toronto, Miami, and other cities.

We are giving thorough study to the operation of authorities in various parts of the country and endeavoring to reach conclusions concerning the desirability of recommending one or more such agencies in this area.

We doubt if sound judgments can be made respecting the planning and administration of various activities in the Potomac River Basin until we have some clearer concept of where they fit into an overall regional plan for developing transportation and other community facilities and services. At this time I will, therefore, comment briefly on the staff reports which have been issued dealing with the various phases of Potomac River Basin problems.

By far our prime concern in these reports is that there shall be an ample supply of water available to the Washington area in the foreseeable future.

Our second concern is one which perhaps is most urgently in need of being improved, ways and means of cleaning up the river or controlling pollution.

Thirdly, we are deeply interested in port and channel improvements and the maximum feasible commercial development of the lower river. We are also interested in recreation and conservation matters. In all cases we are concerned with these problems to serve a community which we estimate conservatively will approximate 5 million people forty-odd years hence. I would emphasize, however, again that our primary interest must deal with water supply and pollution control.

A great deal of information is available about the Potomac River Basin, but more is needed and should be provided at the earliest practicable date.

Perhaps the most important study now in progress is the comprehensive Potomac River Basin survey being conducted by the Corps of Engineers. While the scope of this study is not within the jurisdiction of the joint committee, we do hope that the members of this committee will give strong support to the proposal to increase the 1959 appropriation for conducting it from $230,000 to $500,000. Even with the additional money it has been estimated that it will still be approximately 3 years before this essential study can be completed.

We fully agree on the need for an agency to conduct further studies and make plans for the future of the Potomac River Basin. We do not see the need for the suggested Federal Board of Review and Coordination or Federal-State Inter-Agency River Basin Committee included in the staff report.

We believe it would be preferable because of the time factor to utilize existing agencies. The Interstate Commission on the Potomac River Basin is an agency which developed out of a basin organization which originated in a conference called by the board of trade in the late 1930's.

Our concept at that time was that such an agency was clearly needed for planning purposes and for coordinating matters affecting the river among the States, counties, municipalities and other governmental agencies in the Potomac River Basin. We suggest that the committee recommend that sufficient additional funds be made available to the interstate commission to enable it to function in this planning capacity.

We are not prepared to comment at this time respecting proposals which have been made for establishing authorities to handle water and sewage. While we agree that unquestionably some regional rather than individual solution is called for, we have been unable within the time available and with the information at hand to determine what services, if any, should continue to be rendered by the counties and cities involved, whether these matters can best be handled through State compacts by contractual relations or by area authorities. As I indicated earlier, we are reluctant in any case to make a recommendation with respect to the manner in which these services should be handled until more data covering other metropolitan area common problems has been studied.

That concludes my statement, thank you, sir.

Representative HYDE. Thank you, Mr. Thompson.

Just one question on one item here. You do suggest that more use might be made of the Interstate Commission on the Potomac River Basin?

Mr. THOMPSON. Yes, we think that could function rather than create additional agencies to move into the field.

Representative HYDE. But at the present time you are not ready to make any specific suggestions about the extent of its use, except that it be given more funds to enable it to function better in a planning capacity?

Mr. THOMPSON. That is right, sir.

Representative HYDE. But you are still, as I understand it, studying the question of the expanded use or authority of that commission?

Mr. THOMPSON. Yes, sir.

Representative HYDE. Thank you.

Mr. GUTHEIM. I have no questions.

Mr. LEVIN. No questions.

Representative HYDE. Thank you very much, Mr. Thompson. We appreciate your taking the time to come.

General Grant, may we have the benefit of your testimony, sir?

We are glad to have you with us sir.

STATEMENT OF GEN. ULYSSES S. GRANT III, PRESIDENT, AMERICAN PLANNING & CIVIC ASSOCIATION

General GRANT. Mr. Chairman, we are very grateful for the opportunity to appear before you.

Our organization is most interested in the great planning problems for the development of our metropolitan area, which is a problem

which is nationwide, as you undoubtedly realize. And we are specially interested in the proper development of the Federal City.

We would like to emphasize our interest in such statements as are contained in your staff report—for instance, in speaking of the marshes that—

> these marshes have such outstanding economic and esthetic value they should be preserved in their entirety.

Representative HYDE. To which report are you referring now, General, so I may follow you? Metropolitan Water Problems?

General GRANT. Yes, sir.

Representative HYDE. Thank you, General.

General GRANT. And again:

> Correction of the shortages and imbalance among the land and water areas required for recreation, relaxation, nature, education, and spiritual refreshment, represents as serious a challenge to the ingenuity and initiative of the basin's people and governments as does the question of how to clean up pollution or meet our future water supply requirements.

In other words, we feel that these are matters of social importance, social values that need to be considered as much as the purely economic problems that are brought out in this report and the other report, the sewage disposal and water pollution problem.

We are opposed to a high dam above Great Falls which will destroy much of the C. and O. Canal area, which we hope Congress will make into a national park, and we do not see the need for hydraulic electric power.

Senator BIBLE. General Grant, pardon the interruption. I am sorry that my prior commitments made it impossible for me to be here for the morning session. If you will proceed.

General GRANT. We recognize the imperative need to provide adequate water supply, but believe that that can be done without building a dam of a height that would imperil other values that we think so important to the Nation's Capital and to the whole metropolitan area's future in providing amenities for the growing population.

We therefore would recommend that you ask the District Engineer to include in his survey a careful study of the possibility of a lower dam which will take care of the water supply, possibly a part of the flood control problem, and would not do harm to the natural conditions that we feel are of great value and something that no other city has as Washington has.

We feel that the power, electric power demand, can be filled more cheaply by steam plants in this area, where coal is obtainable, and where it may be sound economy from the national standpoint to provide a market for coal. In fact, a few years ago, when this question was up, such studies as I could make indicated that steam power could be furnished just as cheaply as water power. And the question of the cost to the received is naturally a subject of commission supervision, utilities commission supervision, in the various areas.

Secondly, we do feel that the pollution problem is most important, and we hope that some progress can be made in solving that.

May I suggest the rather satisfactory results that they have obtained under the Ohio law for the cleaning up of their streams in Ohio. It may be worth looking into if that has not yet been looked into. Also that the silt problem is a part of that, an important part

of that purification problem, and that that seems to be one which ought best be solved by soil conservation works, and the encouragement of them.

Besides that statement of what we feel is desirable to attain, may I also animadvert to your questions about organization to secure results. And there I must speak somewhat from my own standpoint, because our two associations have not had an opportunity to meet and study and take formal action on this report. But I feel confident that they will recommend a greater use of the Interstate Commission on the Potomac River Basin as a central planning and coordinating agency, aside from technical reports that perhaps someone else, another agency, such as the District Engineer on the design of dams, and so forth.

We feel that there you have an agency already established which it has taken years to establish, which has a big background of knowledge and experience, and should be utilized.

Again, the question of funds comes in and how those funds can best be obtained is a matter which Congress knows more about than I do, sir.

For many years our organizations have both felt a great need for a metropolitan area development agency of some sort or authority which would act a little bit like the Port Authority in New York or New Jersey, or other similar authorities—I believe Allegheny County has such an authority. Of course, Toronto has a very extensive organization which perhaps we are not quite ready for yet. I think it would be difficult to set up such a controlling agency. But our idea of a metropolitan development area agency would be one which could do the things that none of the existing agencies can do.

It would not be a controlling body, but would be one which would have authority and background and adequate technical help—come to Congress and go to the Congress and the States for the funds necessary for projects which are definitely of metropolitan value and importance.

I think that is all I have to say, sir.

Senator BIBLE. Thank you, General Grant. I again express my regret at not having heard the preliminary part of your statement.

Mr. GUTHEIM. I have no questions.

Mr. LEVIN. No questions.

General GRANT. I would like to ask if we can, at the next meeting, perhaps consider a written report which I will send in, sir?

Senator BIBLE. Has it been incorporated as part of the record yet?

General GRANT. I had not written report today.

Senator BIBLE. The record will be kept open for the purpose of allowing you to submit your written report, and it will be considered. Thank you.

STATEMENT SUBMITTED TO THE JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS BY MAJ. GEN. U. S. GRANT 3D, PRESIDENT OF THE AMERICAN PLANNING AND CIVIC ASSOCIATION AND ITS COMMITTEE OF ONE HUNDRED ON THE FEDERAL CITY

Hon. ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems,
United States Senate, Washington, D. C.

MY DEAR SENATOR BIBLE: Taking advantage of the permission granted me, when I appeared before your Joint Committee on Washington Metropolitan Problems, I submit my statement on behalf of the American Planning and Civic Association and its Committee of One Hundred on the Federal City.

In general we are in accord with the staff reports on metropolitan water problems and on sewage disposal and water pollution, subject to the following comments. We feel that these two staff reports are generally excellent and are most helpful in summarizing the problems themselves and the pertinent facts succinctly.

We recognize the primary necessity for providing for the future requirements of municipal water supply for the growing metropolitan region, but we place in second and close priority the importance of preserving the amenities of life available, especially the parks and open spaces so necessary for the relief of the city dweller from the tensions of urban surroundings and for recreation. Such open spaces as the National Arboretum, the Soldiers' Home, Observatory Circle, and Gallaudet College, in addition to the valuable special services they perform are necessary breathing spaces for the city and appropriate adjuncts to the Capital. So, we urge that your committee give due consideration to their retention as well as to enlargement of the park system to meet the ever-increasing needs of a growing population that enjoys increased leisure. We believe that ample opportunities for outdoor recreation and that "touch of nature which makes all mankind kin" is no longer a mere matter of enjoyment but a practical need for the health of our citizens and a preventive of crime, especially of juvenile delinquency.

We, therefore, emphasize our agreeemnt with the statements on page 7 of the report on metropolitan water problems, viz.:

"Because these marshes have such outstanding economic and esthetic value they should be preserved in their entirety. The larger marshes, as named above, especially need the protection that only acquisition by the public could assure."

"To sum up, the correction of the shortages and imbalance among the land and water areas required for recreation, relaxation, nature education, and spiritual refreshment represents as serious a challenge to the ingenuity and initiative of the basin's people and governments as does the question of how to clean up pollution or meet our future water-supply requirements."

Special importance attaches to the above facts, because of the continual effort to take over parkland and open spaces for highway purposes and buildings, thus destroying their primary purposes and depriving the public of the benefits foresightedly provided heretofore. Your committee's assistance in preventing such harmful encroachments on parks and open spaces is respectfully requested.

As silt is such an important element in the river pollution, we also beg your committee's assistance in securing a broader and more extensive soil conservation program for the Potomac River Basin, in addition to the construction of sewage treatment plants, and suggest recommendations to the various jurisdictions concerned that they make every effort to secure and support such an enhanced program. New building projects and the consequent increases in paved roads, roof areas, and grading are rapidly changing the runoff into the basin's streams and will destroy their values unless controlling methods are devised and established to reduce the amount of silt and raw sewage and to counteract their harmful effects.

As in the past we oppose any dam at River Bend high enough to destroy a stretch of the C. & O. Canal. The latter is a unique remaining example of the means of transportation for heavy goods used by the generation that founded our country. It is not only a facility for unusual recreation, but it also has educational value, so that Americans of today can see what a canal of the mid-19th century looked like and how it worked, and it is contained in a rarely interesting and picturesque 185 miles of parkland constituting an invaluable recreation area such as no other city has at its very doors.

Manifestly such a high dam as the district engineer has recommended is not required for the water supply of the future and reasonable river regulation and flood protection. The height so harmful to the C. & O. Canal and the preservation of the scenic value of the riverbanks is for the production of hydroelectric power. The production of subsidized electric power in this locality is not only entirely unnecessary, but economically unsound. Worse than carrying coals to Newcastle it will be destructive of two industries which it would be advisable and in the public interest to help rather than undermine: (1) coal mining to the north of us, and (2) the electric power industry now serving us so well.

We are not informed as to the economics of the study now being made by the district engineer and have no adequate field data or office force to make our own estimates. However, some years ago, when a like proposal was made and

under consideration, no less an authority than ex-President Hoover pointed out that this hydroelectric plant would be much more costly in capital cost per kilowatt installed than most of the successful plants in the country. While construction costs have probably quadrupled since then, there has been nothing to change the relative cost of the investment. More recently a study indicated that if the Government wants to subsidize electric power for this area, it would be more economical to construct steam plants.

When the fact is taken into consideration that the cost of a dam increases very rapidly with its height, since it is the underpart, constantly broadening in cross section to support the added pressures, that must be added to in order to give the additional height, it is quite possible that a dam of sufficient height (with supplementary low dams upstream, if necessary) to provide the needed water supply storage and river regulation to meet municipal needs will be sufficiently low in first cost to be self-liquidating. We, therefore, recommend that such a dam and its costs and returns in sales of water and allowance for such flood protection as may be obtainable without destruction of park and natural resources values, be included in the district engineer's study and report.

Finally, the creation of an electric power supply in excess of the immediate requirements is more than likely to induce an excessive and sudden mushroom growth of heavy industry, which, we submit, is not desirable for the National Capital region. Such multipurpose dams with subsidized electric power have been beneficial in aiding the development of our arid regions, but there is no need or justification for the harm that will be done by it in this area adjacent to a highly productive coal region.

The same may be said of the too frequently vaunted recreational facilities of the lakes formed thereby. In the arid regions of the West these facilities doubtless have great value; but here with the special sporting facilities of the upper Potomac and the large quiet water stretches available at Washington and downstream therefrom, such a large lake as proposed by the high dam will be of very doubtful value and certainly much less value than the unique recreational facilities and resources it will destroy.

In regard to the administrative organization considered in the two staff reports, especially on pages 16 to 18 of the Metropolitan Water Problems Report, we recommend that the Interstate Commission on the Potomac River Basin, secured by agreement after long years of effort and now with a background of knowledge and study over many years, is the proper coordinating agency; and that it should be given funds and an adequate staff and authority to act as the central coordinating agency for all projects affecting water supply, sewerage, and sewage disposal, reporting to your joint committee, which we hope Congress will perpetuate, on these matters with its recommendations and such regulating authority as you may see fit to give it.

For many years we have, after much study and consideration, reached the conclusion that a Regional or Metropolitan Area Development Agency is needed, (not a planning agency as the Regional Planning Council is the latter) with authority like the New York Port Authority to make designs for and construct public works affecting the region as a whole—or at least more than one political jurisdiction, and to raise funds therefor by bond issues or direct Federal loans, repayable when practical from income or in small annual installments which the jurisdictions can afford. Such an agency would, of course, not do away with works already financed and in operation, except when economically beneficial to the region, but it could create the needed mass transportation facilities as well as solve the water supply and sewage-disposal problems with due foresight for the future. The creation of such an agency will require an interstate agreement.

A subcommittee of our committee of 100 2 years ago had interviews with the Governors of both Maryland and Virginia, and found them ready to appoint a representative to consider the terms of an agreement to this end, for recommendations to their legislatures. It has also had the benefit of a study for it made by the Harvard Law School Research Council. We would be appreciative of an indication as to whether your joint committee favors and wishes the matter to be carried any further. Perhaps the matter could be better handled by your staff than by volunteer members of our citizens' organization, as progress could more readily be made in the negotiations with your official backing. The effort had the approval and encouragement of the late Senator Neely.

Respectfully submitted.

U. S. GRANT 3d, *President, APCA.*

Our next witness is Mr. Gray. Good to see you again, Mr. Gray.

Mr. GRAY. It is good to see you, Senator Bible.

Senator BIBLE. I am familiar with your capacity with the Federated Citizens.

Now, is this a second hat—the Citizens' Council for a Clean Potomac?

Mr. GRAY. That is right. I have two part-time nonpaying jobs.

Senator BIBLE. I am sure you do equally well in both.

You may proceed with your statement, sir.

Mr. GRAY. Thank you.

STATEMENT OF HAROLD GRAY, ON BEHALF OF THE CITIZENS' COUNCIL FOR A CLEAN POTOMAC

Mr. GRAY. I am Harold Gray, speaking as chairman of the Citizens Council for a Clean Potomac.

The Citizens Council for a Clean Potomac is an organization whose membership is composed of organizations, business firms, and individual members dedicated to working toward ending pollution of the entire Potomac and its tributaries; in aiding in the conservation and development of the resources of the river, its tributaries, and their valleys; and in assisting in restoring the natural beauty of these waterways.

The PTA works for better laws for the Education Department. Our council works for a cleaner river and better laws for the Sanitation Department.

For the information of this committee, there is attached to this statement a list of the organizations which cooperate with the citizens council and a policy statement which includes our objectives for 1958.

I won't read all those points, but just a couple. Point 10 says:

> Urge the sanitation officials of all jursidictions in the Washington metropolitan area to work out a long-range, areawide pollution: elimination plan through the auspices of the Washington Metropolitan Regional Conference and Senator Alan Bible's Joint Congressional Committee on Washington Metropolitan Problems.

Another point in our general platform is point 4:

> Urge the United States Corps of Engineers to finish and publish its study of the Potomac River as soon as possible, and that it be broadened to include all pertinent aspects of river-basin planning, including provisions for cooperation with other agencies to achieve a significant reduction for silt pollution on the river and its tributaries. Work toward the establishment of an organization with a broader representation of Federal agencies to make a comprehensive plan.

The Citizens Council for a Clean Potomac is primarily concerned with a clean river which will provide swimming, boating, and fishing, and which will not endanger the health of those indulging in these types of recreation. As such, we were very much impressed with Mr. Levin's analysis of the problems connected with water use in the Washington metropolitan area.

We feel, however, that there was insufficient time for us to take a position with regard to the specific questions he raises as to how these problems may be handled.

We are concerned that, in the face of a mushrooming growth in population, no provision has been made for controlling pollution which this growth factor has engendered. A prime example is the relocation of Federal agencies in areas with no facilities for municipal services.

The Federal Government recognizes that it has a responsibility for its own installations, although the existing treatment facilities, according to Mr. Levin's report, are not always as adequate as they should be. However, there is no acceptance on the part of the Federal Government of its responsibility for the satellite communities which will inevitably surround the new and proposed Federal installations.

At the present time, these are well beyond the limits of existing sewerage systems. It is too expensive for sanitation authorities to build connections through long distances of thinly settled areas. Small plants are not a satisfactory solution, either. We would respectfully suggest that the Federal Government must recognize its responsibilities to the areas in which it plans to locate.

The system by which the Government puts in connections only for its own buildings is wasteful and expensive. If sewerage systems adequately sized to take care of the Federal installation, the satellite community, and the anticipated population were installed at one time, this would obviate waste and duplication.

Of course, we envisage a system by which the Federal Government has this responsibility, not only because Washington is the Nation's Capital and the Potomac River has national significance, but, also, because these facilities are for Federal purposes and the result of Federal activities. Therefore, Federal expenditures which might not be justified in other river basins are clearly indicated here.

This would include the District of Columbia, itself, which needs Federal assistance to install the recommendations of the Board of Engineers' report to the Sanitary Engineering Department of the District of Columbia. We urge that this committee will initiate action to insure that the Federal Government will not approve programs to establish facilities in new locations without arrangements being made concurrently for the satellite communities which will grow up around them.

We feel strongly that the arrangements should not mean small plants proliferating in the area above the metropolitan region's water supply.

The Citizens Council for a Clean Potomac is opposed to any development from the mouth of the Monocacy River to Rock Creek that will add domestic or industrial wastes, treated or otherwise, to the river. We believe that disposal of fully treated wastes downstream of the metropolitan area is the most desirable way of handling the pollution problem.

We are concerned with other features of Mr. Levin's and Mr. Frank's reports. We have felt for some time that there is a need for research with regard to various features of the river for basin development.

We would like to see this committee initiate studies in more detail of the river's assimilation capacity, of whether there is an economically feasible way of separating the combined sewerage system of the metropolitan area, of various means of controlling silt.

We understand that the current study being undertaken by the United States Corps of Engineers does not include any of these features. We are not in a position at this point to recommend which or what kind of agency should undertake these studies, but we would hope that this committee will recommend that it be done by an impartial agency.

Naturally, we are concerned with the question of water supply. We are desirous of having the supply protected from pollution and of having an assured quantity available. We are, therefore, supporting a more adequate appropriation for the Corps of Engineers survey.

We would hope that the survey can be broadened and expedited. The increasing cost for acquiring land in the face of the expanding population and the increased demands on the supply by this population and the outlying Federal installations, and also by irrigation, make it essential that plans must be completed in the very near future.

As Mr. Frank's and Mr. Levin's reports point out, this planning must be done on a basinwide scale. We urge this committee to ascertain what aspects of such a program are not being covered presently by the Corps of Engineers' survey, and that it make recommendations that such studies be undertaken. We believe that the problems of the metropolitan area cannot be separated from the problems of the Potomac Basin as a whole.

We agree with Mr. Frank that there must be an adequate long-range plan for making full use of the resources of the Potomac River Basin. It is for this reason that the Citizens Council for a Clean Potomac has taken the position cited above, to end pollution of the entire Potomac and its tributaries, and to assist in the conservation and development of the resources of the river, as a part of its program.

We respectfully request this committee to ascertain what elements of such a comprehensive plan should be, to determine whether the present Corps of Engineers' survey covers such elements adequately, and to take such action as may be necessary to insure that a full study will be made embracing all elements to the end that a comprehensive program for the Potomac River Basin and its resources will be developed.

And, Senator Bible, the next page lists the 70 cooperating organizations, which I will not take the time to read.

Senator BIBLE. It is very helpful to have them for the record. Does that conclude your statement?

Mr. GRAY. That concludes my statement, sir.

Senator BIBLE. Thank you very much, Mr. Gray.

Mr. Levin, do you have any questions that occurred to you? Your name is used here a number of times.

Mr. LEVIN. I do not have any comments.

Mr. GRAY. Thank you for the opportunity to appear before your committee.

Senator BIBLE. Do we have further witnesses?

I understand we do not for the morning. If not, we will stand in recess until 2 o'clock this afternoon.

(Whereupon, at 12:30 p. m., the hearing was recessed to reconvene at 2 p. m. the same day.)

AFTERNOON SESSION

Representative HYDE. The meeting will come to order.
Our first witness will be Mr. Cary.

STATEMENT OF WILLIAM H. CARY, JR., CHIEF OF THE BUREAU OF FOOD AND PUBLIC HEALTH ENGINEERING OF THE DISTRICT OF COLUMBIA, DEPARTMENT OF HEALTH

Mr. CARY. Thank you, Mr. Chairman.

Representative HYDE. Mr. Cary, we are glad to have you with us. Will you state for the record your full name and whom you represent?

Mr. CARY. I am William H. Cary, Jr., Chief of the Bureau of Food and Public Health Engineering of the District of Columbia, Department of Public Health. I represent Dr. Daniel L. Finucane.

Representative HYDE. Do you have a prepared statement?

Mr. CARY. I have no prepared statement. I understood there was some questions that the committee desired to ask me, and I am available for that purpose.

Representative HYDE. Have you read the water reports?

Mr. CARY. I have read the water reports; yes, sir.

Representative HYDE. Do you have any comments or observations that you would care to make about those reports?

Mr. CARY. To start with, Mr. Chairman, the Health Department has, for a number of years, been quite concerned with the growing problems of the needs of water supply and the necessity to protect that supply by making a plan for waste disposal, wide-waste disposal.

We have long advocated that some metropolitan area or regional plan was necessary, not advocating one plan as against the other, but recognizing that we did need basically a plan to provide the necessary amount of water of the quality that would be satisfactory for this community.

I might say that at the present time Washington and the metropolitan area that draws on the Potomac River has as its source, an enviable supply of raw water. Not in quantity. It is there if we will save it, if we conserve it; but as far as quality is concerned, it is very good.

We have noticed some encroachments on that supply in recent years as the urban community has begun to envelop the source itself, but that envelopment hasn't reached the point where it will endanger the quality of the supply at the moment because we have followed out certain sanitary facilities.

For instance, recently, the Potomac River intercepter that goes up into Maryland has been extended up through the Cabin John Valley until we are now taking the sewage that was generated in Rockville and bringing it down through that intercepter to the Potomac River intercepter, and thereby carrying it down to the Blue Plains plant of the District of Columbia.

The District of Columbia itself, as Mr. Auld pointed out, is pretty adequately situated as far as water supply and sewage disposal is concerned. But we are constantly getting into competition with the rest of the area for that water source.

In fact, I see a greater need for that source. If you will think for a moment of this coastal plain, and using Washington more or less as a center and looking north and south of here, you find nothing between here and the Susquehanna River to the north that will produce any quantity of raw water—sweet water. You can find plenty of brackish water, but to get a large quantity of sweet water you are going to have to go to the Susquehanna River to the north.

You can go as far south as the James before you get any quantity there. And if a so-called supermetropolis develops in this area—this huge metropolitan area extending somewhere from New England down to Virginia—if that growth continues, as it has in the past few years, we are not only thinking in terms of this area, we are talking about as shown on the map here, but we are going to have to expand our vision a little bit in my opinion.

Representative HYDE. Don't you invision we are going to need a good comprehensive regional plan to adequately protect our supply in this area?

Mr. CARY. Absolutely.

Representative HYDE. Do you consider that we will need some sort of a continuing regional organization for the purpose of protecting the future water needs of the area?

Mr. CARY. We will need to have some way of obtaining adherence to that plan.

Now whether you need a complete regional organization or not, I don't know, but I am thinking at the moment of the situation as it obtains at Rockville. Rockville has their own autonomous sewer system, but they are connected into the intercepter that is provided by the Washington Suburban Sanitary Commission that now, as I say, connects them through to the Blue Plains plant.

Representative HYDE. Mr. Cary, what about the matter of the regulation of the pollution or contamination, if you please, of the river? Do you think the present system of setting standards and regulating and conforming to those standards is adequate?

Mr. CARY. Not at the present time in my opinion, I don't think it is adequate at this time.

I think we have got to have more, we have got to firm them up. These standards that have been set have only been presented for consideration. Nobody has accepted them, none of the jurisdictions have of themselves said these are the standards that we will enforce.

The jurisdictions that have authority, for instance, two principal States, Maryland and Virginia, or for that matter the District of Columbia, haven't said that these are the standards that will accept and enforce. These standards are merely up for consideration. They are a good starting point, but they are not anywhere near the finish line.

Representative HYDE. These standards have been proposed by the Interstate Commission, are those the standards to which you refer?

Mr. CARY. Those are the standards to which I refer.

Representative HYDE. I gather from what you say that these standards have not been agreed to by any of the jurisdictions in the area?

Mr. CARY. That is right. Mr. Tisdale was authorized by the Interstate Commission to present these standards to the jurisdictions that would be affected by them for their consideration. To my knowledge nobody has replied.

Representative HYDE. Have they been presented yet?

Mr. CARY. They have been presented, I believe, officially by Mr. Tisdale to these jurisdictions.

Representative HYDE. Do you know when that was?

Mr. CARY. They were—he was authorized or instructed in the meeting, I believe it was in September and I think they were presented to the jurisdictions in October.

Now, I may be wrong a little bit on those dates, but I think that is correct.

Representative HYDE. Does the District Health Department have these under study now?

Mr. CARY. The District has them under study now, for the District.

Representative HYDE. But they have not——

Mr. CARY. They haven't acted on them.

Representative HYDE. Do you envision in the future any difficulty of uniform compliance by the various jurisdictions with any proposed uniform standards by body such as the Interstate Commission?

Mr. CARY. I am going on my experience. In the past I have seen these things adopted in other localities and it is quite difficult to finally get everybody to see them just alike, even though they adopt the same language. They might have a different point of view, and the enforcement varies from jurisdiction to jurisdiction.

I could envision that that might obtain in this area too.

Representative HYDE. Is there anything further that you would like to say, Mr. Cary?

Mr. CARY. I have been in public health work since 1925 and previously was connected for a short time with the Sanitary District of Chicago, and had some little experience working on designs of sewage disposal systems.

My principal work in public health has been in connection with water supplies and waste disposal problems, although I have worked in all phases of the environmental health program.

My feeling is one of growing concern that we are rapidly approaching a time when we are apt not to have water enough for our Nation's Capital, and I would hate to have anybody in the world say that we have had a chance to get water enough and didn't get it.

Representative HYDE. Mr. Cary, from your experience in this area and other similar areas where you have an interstate river bordering on which are a number of different autonomous political jurisdictions, have you found it difficult to get any uniform regulation for the health standards of the water in such a river?

Mr. CARY. Now, my dealings with such organizations have only been through observation and working on the outside; never on the inside of such groups except of course, as I worked in Detroit, and we were in the international waterways situation there. We had difficulties at arriving at common ground.

The problems had to get bad before anything was done about them to make them better. I don't want to——

Representative HYDE. In other words, you had difficulty in arriving at any uniform agreement before the situation——

Mr. CARY. Before the situation got so bad that it was pretty tough to do, and I don't want to see that happen. I don't want to see sewage dumped into the water from which the Nation's Capital takes

its water supply. Very little is getting there now. I don't think we want to see more get there.

Representative HYDE. Can you say from your observation and experience that the growth of industrialization in the area increases the difficulties of such uniform enforcement?

Mr. CARY. The growth of industrialization would materially increase the difficulties because industrial problems are sometimes very difficult to handle. We have a really simple engineering problem here.

Representative HYDE. At the moment.

Mr. CARY. At the moment. Our real problem at this moment is these artificial political boundaries we have established.

Representative HYDE. Well, doesn't industrialization, if you can say from your experience, increase the pressures—the political pressures, if you please, in the various areas, and thus make it more difficult?

Mr. CARY. They increase the difficulties, not only the political difficulties, but they increase the physical difficulties of doing something about it.

Representative HYDE. And then, do you feel from your experience that a lot of these difficulties can be overcome if there is some uniformity of regulation?

Mr. CARY. If we get some uniformity of regulation and uniformity of thinking and agreement, which we are seeking now, I would believe——

Representative HYDE. Does that go so far as to include in using the word "uniformity" that is uniformity in the sense of one body responsible for regulation and control? Do you think that that would relieve the difficulties caused by pressures which come with increased industrialization?

Mr. CARY. It is always helpful. I have observed this situation under other circumstances; that where a situation like this with local, autonomous bodies, were all within one State you had a State water pollution control agency that was applying equal pressure of the same kind toward the same end on each one of those communities, that you obtain results much faster and sometimes more satisfactorily than you did where there were several State jurisdictions with no overlying organization to interpret or set standards or plan so that the thing could be done in an orderly fashion.

Representative HYDE. Thank you. That is what I had in mind. Do you have any questions?

Mr. LEVIN. Yes; I do. Mr. Cary you have, as you have briefly summarized, very extensive experience in the sanitary and public health engineering, but we have been discussing the relative merits of sewage disposal vis-a-vis a number of small separate plants in the urbanized area versus the concept of transporting the sewage downstream from the urbanized area, treating it and discharging it to a main water course.

Would you please comment on the public health implications of these two methods?

Mr. CARY. Well, in the first place I would like to differentiate a little bit between the way we operate our sewage treatment plants generally, how we administer them and how we administer the operation of our water supply plants.

Everybody recognizes a water supply plan is immediately hazardous to the people of the community if it isn't properly operated. Therefore, first priority in most instances is given to spending money to improve and protect water supply plants. Despite that fact, there have been recorded a number of instances when water supply plants have failed to properly protect the health of the community.

On the other hand, we have unfortunately accepted sewage treatment plants as something more that takes away a nuisance rather than meets a public health problem, meets it face to face, and we have been willing to provide less in the way of plants—less in the way of supervision, less in the way of technical guidance—and I might say in traveling about the country, in visiting many local communities, I have observed that where you could always find a competent individual, or usually find a competent individual, where you were operating a water treatment plant, that very frequently you would have to go look up somebody to talk to in a small sewage treatment plant, to find somebody more than just a laborer or beyond the physical labors that he could do had he the ability actually to discuss the operation.

So you have that limitation that comes from a small plant.

In the second place, there is not the money to hire the people.

In the third place, it is much easier to meet a peak overload, to level out this problem in a large community.

Many plants fail to function mainly because they get more sewage than they can take care of. In a large system, there is more sewage generated in a small area of a community than could be taken care of by a small plant serving that area.

It is absorbed more readily in the larger facility. So we have less cause for breakdown. Large facilities, facilities that are integrated into large system, operate more efficiently.

Mr. LEVIN. In one of the main reports on which the northern Virginia region decided to pursue the policy of erecting separate sewage-treatment plants and systems, the following quotation appears:

> In analyzing relief requirements of existing trunk service, however, it was recognized that expenditures for relief facilities, as a practical matter, were not likely to be undertaken the instance such facility fell below ideal capacity requirements, but only after increasing overflow of sewage there from waste such as to receive public notice.

Would you comment on that philosophy?

Mr. CARY. It is too often true. It is just a fact that the sewage-treatment plant really receives little notice from the community until it is creating a tremendous problem for the community.

Mr. LEVIN. But as a health official, you would be alarmed if this were set forth as a policy?

Mr. CARY. I wouldn't want to see it followed as a policy, certainly.

Mr. LEVIN. Thank you. We were discussing the combined sewers in the District of Columbia, which Mr. Auld will discuss later, but I would like to ask this question: In view of the fact that we all seem to be agreed that a separation of the combined sewers is highly desirable as an ultimate objective, do you believe that at this time we could enact a regulation as was recommended by the Board of Engineers consulting to the District of Columbia, to require that all new construction be constructed with separate facilities in turnover, even

though these new buildings might be at the present time in a combined sewer area?

Mr. CARY. I actually so recommended to the Committee of the District several years ago. I don't know whether you can enact such regulations or not, as there is a lot of pressure not to, but I believe that will be a step forward and a step in the right direction from the public health view, to look forward ultimately and doing the little things now that we can that will ultimately make it possible to make these changes in the future without such tremendous expense to the public.

Mr. LEVIN. Do you think that such a regulation would work in an inequity on developers?

Mr. CARY. My own feeling is this, that to put proof drainage and domestic sewage into the same system within the building is asking for trouble.

Actually, I have seen too many times when the building sewer had become overloaded, supercharged for some reason or another, due to clogging or otherwise, and that roof drainage has come right up into the building, much to the detriment of the property. I think more property has been lost that way then providing some means of protection, and one means of protecting is to separate it until at least it gets outside of the building, and when these things occur inside, you can provide some internal protection from preventing that coming into the building.

Mr. LEVIN. Would you say any builder designing his building, as combined internally, would be taking advantage of existing conditions whereas if he separated his sewers internally, this would be merely complying with the same conditions that most builders comply with throughout the area?

Mr. CARY. I wouldn't know whether most builders comply with such a separation or not, but I would suspect that many builders do because so many problems are engendered by putting the two systems together.

Mr. LEVIN. I meant by separate area.

Mr. CARY. In a separate area, of course, and those are the large areas in the metropolitan area.

Most of the storm water is separated, because going to sanitary sewers for treatment, they can't afford to treat the storm waters, of course.

Mr. LEVIN. Thank you very much. I have no further questions.

Representative HYDE. Thank you very much, Mr. Cary. We appreciate the benefit of your testimony.

Mr. CARY. It has been a pleasure to be with you.

(The following was supplied for the record:)

The problems connected with the Potomac River pertaining to planning, programing and construction of water and sewage works have been widely discussed by the concerned adjacent States and the District of Columbia for the past few years.

Our Nation's Capital is unique with respect to its geographical limitations. Its compact and limited size makes it the focal point of many problems occasioned by the rapid metropolitan area growth. Not the least of these are the environmental health problems relating to the assurance of a continued and ample supply of good water and the sanitary disposal of waste products. These could become, without careful planning and execution, the controlling elements in future growth patterns. They are, by and large, the future's most demanding need. (See appendix titled "Public Works" for additional information on this matter.)

In certain areas of the city there is a problem governing house connections to water and sewer services. The act of Congress approved May 19, 1896, title 6, chapter 4, section 401 of the District of Columbia Code (1951) provides that all original lots of subdivisional lots located on any street where public sewer and water mains are available shall be connected thereto. By its language this act exempts parcels of land and property described by metes and bounds. At the time the act was approved there were many farms in the District of Columbia, which land was not intended to be covered by the law, and therefore the application was to original lots and subdivisional lots only. This situation, of course, has changed considerably over the years, although there remain in the District of Columbia many pieces of property to which this act does not apply.

The Department of Public Health is studying this problem at the present time to determine the advisability of recommending a modification of the existing legislation.

Representative HYDE. Are there any other health officers here from neighboring counties in Virginia?

(No response.)

Representative HYDE. I would like to say that I am somewhat disappointed that none of the health officers are here this afternoon from the Virginia counties. They have been invited, and we would certainly like to have the benefit of their testimony.

While the political leaders and engineer officers of these counties in Virginia have made a valuable contribution, we are here dealing with what is admittedly a health problem, of fundamental importance to the community, and the committee should not like to think that any health officers are being ordered not to attend the hearings and I hope we will see their participation Friday morning when these hearings continue.

Now who is our next witness?

Mr. GUTHEIM. Mr. Brown.

STATEMENT OF STANLEY BROWN, CHAIRMAN OF THE ZONING COMMITTEE OF THE LOUDOUN COUNTY PLANNING BOARD

Representative HYDE. Mr. Brown, glad to have you with us. Will you, for the record, give your full name and whom you represent?

Mr. BROWN. My name is Stanley Brown. I am chairman of the zoning committee of the Loudoun County Planning Commission, and, for some years, chairman of that commission.

Loudoun County has more than a minor interest in that one of the dams contemplated by the Corps of Engineers would permanently flood 5 percent of the entire Loudoun County, and this is our very best farmland; that metropolitan Washington has an interest heretofore not stressed, as brought out very well on page 22 of Mr. Levin's report.

You said in substance that questions have been raised as to the possible consequences to Washington if the River Bend Dam were destroyed.

In May 1943, Squadron 617 of the British Royal Air Force destroyed the Mannheim and Oder Dams controlling the waters for Germany's rural areas. For 40 miles the damage was terrific.

The River Bend Dam would be as high as these dams, and carry 5 to 6 times the volume of water for those dams.

So may I humbly suggest to you that this phase be given prompt and careful attention, and I think that when the facts are brought out, possibly the Corps of Engineers and the many other people will find

compelling reasons to change their points of view on the whole problem.

Representative HYDE. Mr. Brown, are your remarks directed to the proposed high-level dam?

Mr. BROWN. Certainly would be much more appropriate.

My next remarks are addressed in general to any very large, single impoundment sitting very close to Washington. Of course, the further up the stream from Washington, the greater the chance for diversity of the flooding, and the less damage done to Washington.

But, certainly, I know of no large city, certainly no State capital that has hanging over its head the huge dam such as the River Bend Dam that is contemplated.

Representative HYDE. Well, the figures that you refer to in a general way apply to a high-level dam—that is, the extent of the impoundment—is that correct?

Mr. BROWN. Certainly, and particularly at one spot.

That, sir, is all of my own testimony.

I am appearing here this afternoon primarily in place of Dr. Ira N. Gabrielson, president of the Wild Life Management Institute, and one of the leading conservationists in the United States.

Dr. Gabrielson is chairman of the Coordinating Committee on the Potomac River Valley. He was unable to be here this afternoon, and he asked me, as vice chairman of the group, to come in his stead and read his prepared statement.

This I am happy to do, and I should like to express our thanks to the committee for inviting us to appear.

However, this statement is a long one, and if you wish to save time you might permit my prepared statement to be inserted in the record with its three exhibits and without reading it in full.

Representative HYDE. The full report will be received at this point in the record, together with the exhibits, and you may highlight your statement as you wish.

(The statement of Stanley Brown and accompanying exhibits are as follows:)

STATEMENT OF COORDINATING COMMITTEE ON THE POTOMAC RIVER VALLEY

My name is Stanley Brown, of Leesburg, Va. I am chairman of the zoning committee of the Loudoun County planning board. Although I am an engineer by training and profession, I am now engaged in farming near Leesburg. I find it a fulltime job.

I am appearing here this morning in place of Dr. Ira N. Gabrielson, president of the Wildlife Management Institute, and one of the leading conservationists in the United States. Dr. Gabrielson is chairman of the Coordinating Committee on the Potomac River Valley. He was unable to be here this morning; and he asked me, as vice chairman of the group, to come in his stead, and read his prepared statement. This I am happy to do; and I should like to express our thanks to the committee for inviting us to appear.

Mr. Chairman, our group believes that alternative methods to storage in huge dams on the main stem on the Potomac have not been fully explored. And we ask that this be done before we decide to spend 2 or 3 hundreds of millions of dollars for water supply, only to discover, perhaps, that the investment has been made worthless by scientific and technical advances.

The water-supply issue boils down to this:

One side assumes the Potomac River will never be clean—that vast storage reservoirs, costing hundreds of millions, are necessary to flush pollution past Washington.

The other side assumes that the Potomac can and must be a clean river, and that money should be spent for eliminating pollution instead of for building huge dams.

The coordinating committee is on the side of those who want a clean river to adorn the Nation's Capital.

The Coordinating Committee on the Potomac River Valley came into existence last June 6. At the initial meeting there were some 85 conservationists, scientists, lawyers, investment bankers, architects, realtors, homeowners, and similar professional people and citizens represented. At least 25 organizations were informally represented. This ad hoc committee was set up to unify, within an area of agreement, the actions of organizations and individuals interested in the highest and best use of the Potomac Valley.

Since then, its executive committee has met numerous times. During that period one short report was issued containing, in general, the basic attitude of the group toward the proposals to build dams on the main stem of the Potomac River, and, more particularly, the proposed dam at River Bend. I should like to offer this for the record. While there exists a general consensus on the direction of our thinking, I do not wish to say that I speak for every individual in the group. My 40 years in conservation has taught me better than that (exhibit I, brochure I).

The group's platform—as we may call it—was, and remains essentially as follows:

(1) No dams are necessary in the Potomac below Harpers Ferry.

(2) On the basis of any reasonable planning, water for Metropolitan Washington can be obtained from sources other than large impoundments. Experience has shown that plans for more than 50 years are unreasonable, since technical advances outmode even the most farsighted plans. And plans for 200 years would seem to be rather on the fantastic side.

(3) Hydroelectric power should not be generated at any future dam in the Potomac Basin.

(4) The solution of the problem of a contaminated Potomac River is proper and complete treatment—by better techniques than now used—of all sewage emptied into it and its tributaries; and to prevent future pollution.

In this day and age, pollution of our streams and rivers—especially the Nation's river, the Potomac—is intolerable in any kind of civilized society.

(5) Construction of a dam at River Bend would forever remove from gainful use and tax revenue 35,000 acres of high-level residential and agricultural land, destroy 42 miles of the Chesapeake and Ohio Canal; and eliminate the incentive for cleaning up the lower river, inasmuch as it would substitute flushing for pollution control, instead of providing for the complete removal of the causes of pollution.

(6) During periods of protracted drought, augmented supplies of fresh water required for domestic use by the metropolitan area of Washington can be obtained from the estuary of the Potomac River, with proper raw water treatment.

(7) The present beauty and cathedral wilderness of the Potomac River Gorge and the priceless historical and recreational values of the Chesapeake and Ohio Canal should be preserved for posterity. The canal area is the only assured potential for expansion of recreation facilities in the metropolitan area, and, as such its value is inestimable. The Potomac River Valley means to the residents of the metropolitan area what Rock Creek Park means to the residents of the District of Columbia.

I do not think it necessary to emphasize the association of our group with those who are gravely concerned with the water supply problem in our country. This, it seems to me, should go without saying. After all, everyone needs water in order to live. Every living thing needs water.

But I should like to stress one general assumption that we make. And that is our belief that the preservation of our natural environment—natural areas, open spaces, parks—is a great and growing problem in our increasingly mechanized society. Those who follow us in the years to come will desperately need these sanctuaries.

You can go in any of the 48 States of the Union and see the impact of our mechanized civilization. Forests have been sheared. Waterfalls reduced to a thin, sad, trickling flow. Everywhere you meet people who speak of the wild

places they knew in childhood—they are gone. We are rapidly sending our natural environment after the vanishing Indian.

And yet, I have a conviction that despite this growing destruction, there is a slight gain—a growing awareness and appreciation from people in all walks of life for these natural areas, and a mounting determination to do something to preserve them as long as it is humanly possible.

I have no quarrel with our current and consuming interest in matters of outer space, but I should like to ask that we turn our eyes from the sky a moment to look at the ground beneath our feet. There are pressing problems here too, and I shall use a homely example to caution that the pickpocket at the county fair does his best business while all the customers are craning their necks at the ascending balloon.

The pattern of our natural environment is built into our lives here on this planet; and our survival rests upon this relationship. No organism known to biologists—and I speak as a biologist—has ever had things completely its own way.

As Paul Sears, former president of the American Association for the Advancement of Science, has recently put it:

"As life has advanced from simple beginnings, it has played an increasing role in geological processes. Man is no exception. He is a worldwide dominant, the first such species in earth's history. And through advancing technology he is producing tremendous changes. That this should confer a sense of power is understandable. But power is not the same thing as control. Only when power is accompanied by responsibility is there control, as the record of our highway accidents attests. The corrupting effect of irresponsibility is an axiom in human history."

I should like most heartily to commend this committee in its attempt to come to grips with the problems of our complex, technological age as it is reflected in our sprawling metropolitan areas. These problems have got to be met, and it is a heartening sign that the Congress is taking such a great interest in them. We wish a long life for your committee—or, at least, enough time and resources to take a good, hard look at these things, and to inform our citizens about them in every way possible. The Coordinating Committee on the Potomac River Valley is continuing to study the problems facing the river basin; as a matter of fact, here is a rough draft of a report that is in preparation. In it we have tried to be as thoughtful as possible about all these things, because we regard them as of fundamental importance to any kind of decent habitat for human beings.

The number one problem, of course, is the question of pollution. It is a splendid thing to see a growing interest on the part of the general public in cleaning up such a noble river as the Potomac, and to prevent the dumping of sewage in its waters. It is true of course, that some progress has been made in the very recent past. Local officials in neighboring counties, in the District and the United States Public Health Service are beginning to make a good start on the problem, but only a start. We urge the Congress' wholehearted support of the Public Health Service program to clean up the rivers and streams of our country.

Unfortunately, too many of us approach social and engineering problems in this space age with "Model T" thinking. But, as far as the Potomac River goes, there is one engineer who puts his finger on the problem of pollution in a direct and forthright way. He is Mark D. Hollis, Assistant Surgeon General of the United States Public Health Service. In a speech last year before the Citizens Committee for a Clean Potomac, he pointed out that public opinion will dictate the kind of river the country wants for its National Capital. That is will cost a great deal goes without saying. We have the engineering ability to clean up the river. The question is: Do we want to? Our reply, Mr. Chairman, is that we do want to. We agree with Mr. Hollis that with an unpolluted Potomac River, "our Nation's Capital could have a recreational paradise—a proud show case of America's natural beauty."

By the same token, any plan that fails to call for a fully clean Potomac River is a half-way measure; and is only money "thrown down the drain."

We believe that there are enough imaginative and active engineering brains in our country able to discover a way to tie an unpolluted Potomac to our water supply that will diminish what at first glance would appear to be prohibitive costs. To oversimplify a little, we want a river that is "99 44/100 percent pure," despite higher costs over the long haul, because anything less than that will waste our own money and our children's patrimony. We must, like a good surgeon, cut out the whole cancerous mass of pollution lest in the end it overwhelm us.

Because the Potomac is the river that waters the Nation's Capital, we feel that the Federal interest in its problems is a central and enduring one. We should like to associate ourselves with those who request the continuing attention and resources of the Federal Government in making this river once again a lovely water course, and one that the whole Nation may be proud of, because in a very real and abiding sense, it is the Nation's river, too. The Potomac and its comely valley could be a worldwide attraction for generations to come.

Having attacked this pollution problem initially and vigorously, it seems to us that many of our other water supply problems should fall into place; and that as the years pass, and our Nation's Capital continues to flourish, we could meet those problems in a flexible way through either technological progress—the products of man's inventive mind—or through such headwater tributary dams that would do no great and lasting harm to the scenic beauty and economy of the upriver areas. It should be unnecessary to emphasize that in dealing with water resources, those concerned with planning will be defeated from the outset should they develop a rigid and doctrinnaire approach to their problems, instead of a flexible, pragmatic one.

There is no water shortage facing the Capital now. I should like to offer for the record, an article entitled, "The Facts About Our Water Supply," by Dr. Gilbert F. White in the Harvard Business Review, March–April 1958. Dr. White, a former president of Haverford College, Haverford, Pa., is now a professor of geography at the University of Chicago and was also a member of the President's Water Pollution Commission in 1950. His article complements on a national scale, the current facts about the water supply picture in the Washington metropolitan area (exhibit II).

He says that recent local shortages of water and regional droughts have given dramatic emphasis to predictions that the United States is running out of water. Notwithstanding these danger signals, he adds, and in the face of continually increasing industrial demands, it seems likely that the Nation, as a whole, has enough water to go around for a long time to come—if—(and I should like to emphasize the "if")—we take prudent steps to make better use of what we have. This is why we should concentrate our time and money first upon cleaning up the Potomac.

And, again, turning to the situation in the Potomac River Basin, I should also like to offer for the record, a report by the Bureau of Business and Economics Research of the University of Maryland, entitled, "Potomac River Basin," which in general, comes to the same conclusion (exhibit III).

As for the reports of your committee—the Joint House Committee on Metropolitan Area Problems—we have examined them, and, while we do not agree with some of the basic conclusions reached by your consultants, we should like to compliment your committee and its staff upon their industry.

Now let us turn to the problem of water supply for Washington.

Mr. Levin says on page 2 of his report: "That system must now be expanded again to provide for the near future."

We do not agree.

As an indication of absurd statistics on population growth, the total, in table 2, page 5, at the foot of the first column on "Population" is 10,667,500 with a footnote which states "Estimated connected population." The total is a fictitious total of estimates made for various years to the year 2000 for the areas shown and means nothing.

Using the estimates of water consumption in the same table, referred to as reference 5, the totals for all areas for 2,000 is 647.1 million gallons per day (not 650.1 as shown at the foot of the column). Before that year, the Washington Suburban Sanitary Commission will have a total capacity of 85 million gallons per day from sources other than the Potomac; and Occoquan Creek will, it has been estimated, have a capacity of 50 million gallons per day, making a total of 135 million gallons per day available from sources other than the upper Potomac. The difference (647.1—135) is 512.1 million gallons per day to be supplied by the Potomac. The lowest flow of record is 506 million gallons per day. It therefore appears that, at least until the year 2000, there is "a continued adequate supply."

The United States Army Corps of Engineers and the District of Columbia Board of Commissioners evidently share this opinion:

> (1) The Star, in an article on August 15, 1956, regarding the request of the Washington Suburban Sanitary Commission for permission to tap the Potomac River near Watts Branch, stated, "Metropolitan area and Potomac River Basin officials agree that the recommendation to tap the stream gives no cause for immediate concern."

(2) At the hearing held by the United States Army Corps of Engineers on June 27, 1957, Lt. Col. Robert Mathe, Assistant Engineer Commissioner, speaking for the entire Board of Commissioners, stated that, "the entire flow of the river will be needed to meet demands by the year 2000" (Star, June 28, 1957, p. B–1).

(3) In a radio address on August 24, 1957, Col. A. C. Welling, Engineer Commissioner of the District of Columbia, stated, "There is no immediate water supply emergency for the District, but demands are mounting" (Evening Star, August 25, 1957, p. A–23).

(4) Dr. Abel Wolman, consulting engineer, "A Report on Future Water Supply for the Washington Suburban Sanitary District," dated September 20, 1956, in reporting on his recommendation that the Potomac be tapped near Watts Branch, stated, "Withdrawal of the quantities of water required by the sanitary district over the next 50 years would, therefore not only be feasible, but would not interfere with water users downstream by the District of Columbia and by other potential users in the Washington metropolitan area."

(5) Even the United States Army engineers were quoted in an article in the Star on August 15, 1956, "The Washington engineer district office of the Army Engineer Corps, which handles Washington's water supply, warned however, that in 15 or 20 years normal expansion of the area may well require construction of one or more water storage dams upstream."

While it is true that water system should be designed to accommodate peak demands, it also appears that the estimates cited above are high. The average per capita consumption, obtained by dividing the estimated total of 647,100,000 gallons per day by the population of 4,800,000 estimated for the year 2000, is 135 gallons per person which was the District of Columbia average in 1957. However, the estimated per capita consumption for the year 2000 for Maryland is 103, for Fairfax County 120, and for Arlington County 130. Obviously, the weighted average of these figures would be considerably less than the 135 gallons per person used. It must be borne in mind, further, that the average flow of the Potomac is 7.5 billion gallons per day and it does not seem reasonable that, to avoid the restrictions which might be imposed for short periods once every 25 years or so, at some time after the year 2000, to maintain normal consumption of water during periods of low flow, it is economically or morally sound to destroy from 40,000 to 50,000 acres of beautiful river valley and spend millions of dollars for an unnecessary dam.

The estimate cited for "Pollution requirements" is admitted to be a figure "not firmly established as much remains to be learned about the capacity of the river to assimilate pollution." It would appear that the estimate of 950 million gallons per day by 2000 and 2 billion gallons per day by 2100 assume that there will be no improvement in methods of sewage treatment for the next 142 years.

Mr. Levin states at the bottom of page 18 that "it is obvious that a return of the low-flow conditions of 1930 would confront the residents with a dilemma. It would be necessary either to invoke water use restrictions or to permit unpleasant and dangerous water pollution to occur in the metropolitan reach of the Potomac River. * * * The net water deficit would be * * * 380 million gallons per day during the low-flow period."

Another way of stating the problem is that the flow available to dilute pollution would be 650—380=270 million gallons per day instead of 650 million gallons per day, an amount which Mr. Levin has already stated (page 6) "is not firmly established." What Mr. Levin neglected to state is that the low flow of 506 million gallons per day occurred only once in 50 years. Is there anything wrong in imposing restrictions on the use of water for car washing or watering lawns once every 50 years? Bear in mind again, the average flow of the river is 7.5 billion gallons per day.

We do not agree that "it is evident that storage facilities on the Potomac River are needed now."

However, we feel constrained to point out that your committee's reports have, in general, discussed only one side of the water supply problem—supply by storage dams only. This is a single-shot solution and we most strongly urge the committee to study alternative solutions to this problem, such as the use of new technological methods to aid in solving the water-supply problem. Today scientific and technical improvements are being turned out with such bewildering rapidity, that it seems to me to be unwise in the extreme for the Federal

Government to commit itself irrevocably to investing hundreds of millions of dollars for a massive dam on the main stem of the Potomac, only to find in a few short years that science and industrial advances have made it unnecessary. In reviewing the records of river flow and accepting the maximum estimated population, shortage of water would occur in only 1 year in 50. This commitment would be a mistake, of course, but in the words of an ex-President, it would be "a whopper." And it would be an irremediable one.

Figures cited for water needs by Mr. Levin in your report on water supply for the year 2000 contain a lot of luxury items. The base of 650.1 million gallons per day for domestic use of metropolitan Washington is acceptable; 650 or more additional gallons for pollution flushing is a luxury. Mr. Levin backs pollution removal and, on the other hand, advocates flushing.

Another luxury is the acceptance of uncontrolled, unlicensed irrigation. If these luxuries for pollution flushing and irrigation are reduced to a minimum, the need for massive impoundments costing hundreds of millions of dollars can be reduced to reasonable limits or eliminated. The 650.1 million gallons per day maximum needed for domestic water when the absolute minimum of 600 million gallons (including Patuxent and Occoquan sources) is available can be met from the estuary, if reasonable advances in pollution removal and acceptance of new sewage-disposal techniques are used. The use of the estuary combined with reasonable licensing and cost payments for irrigation water will eliminate the costly impoundment necessary for the luxury of irrigation. These luxuries will cost $236 million at a minimum. This money would give far bigger returns if applied to cleaning up the estuary of the Potomac, by complete separation of all sanitary and storm sewers in the District of Columbia and by using new techniques for purification of effluents. We feel strongly that Mr. Levin has failed to emphasize the luxury costs of pollution flushing and uncontrolled irrigation, especially in the light of the fact that the low flow for which the provision for impoundment is needed occurs only about once in 50 years. He has also failed to include in his study any serious alternates to large-scale impoundments. We advocate that studies of all alternate means receive the fullest consideration.

It is completely unacceptable to us to assume that sewage effluent containing contamination should be returned to the Potomac River for the next 142 years—and possibly for all time.

While I am touching on your committee reports, I would like to point out that in the one entitled "Water Supply" there are some misleading statements, such as, for example, the one on page 20. The error lies in the wrong use of the word "stored." Colonel Bird uses the figures correctly in his paper presented at the Chesapeake section of the American Waterworks Association meeting in October 1957, which is apparently the sourse for Mr. Levin's figure. The term should be "cost of million gallons of water used," based on cost of operation, maintenance, and amortization. While technicians may be able to guess at what is meant, the general public would not, and would possibly be misled.

On the other hand, we agree with Mr. Levin that, as stated on page 22, the creation of a single metropolitan area water authority or sanitary district should be examined.

There is one particular point in the report by Mr. Frank that we do not subscribe to. That is that land be bought on both sides of the river, presumably for its entire length, in order to have it if and when some hypothetical dam should have to be built in a water-supply crisis. It is true that this point is not too clear in Mr. Frank's report, and therefore we cannot meet it in any direct way. But we should like to record our opposition to any such move.

And again, about Mr. Frank's suggestion regarding an administrative agency for the basin, at this point we want to make one thing entirely clear. In any such agency, we want to insure that the day-to-day policy decisions on development of the Potomac River Basin be controlled by the citizens themselves. We are fully aware of the complex jurisdictional conditions in the Potomac Valley, as compared with the relatively simple jurisdictional conditions in making the best use of a river basin entirely within one State. For example, the Muskingum River and its conservancy organization. The Muskingum conservancy, by the way, has done an excellent job and I commend to the committee the fine work done there by Mr. Bryce Browning, his associates, and the citizens of Ohio.

Mr. Frank suggests a Federal Board of Review and Coordination for the Potomac Basin. As we understand, this would be a citizen's board, looking to congressional committees for broad policy guidance. While some such approach as this is desirable, it may well be that the Interstate Commission on the Potomac

could be greatly strengthened to do the same job. It is now in existence and has been generally accepted by the States. While it has been little more than a public education agency, it has done a good job as far as it has been able to go. It is not always necessary to throw away an old tool if it can be fixed up to do the job. More money and stronger powers would give to the Commission a sharper edge.

In conclusion, I should like to end again upon a rather homely analogy. In problems such as these, we are dealing with the inexorable problem of space—not outer space, but ground space. Inevitably, we have conflicts between tangible and intangible things, between matter and spirit. When you have a beautiful rose garden on your own homeplace that provides one of the elements of the amenities and, therefore, nourishes the spirit, you find it difficult, should you encounter hard times, to plow up the rose garden and plant it to Irish potatoes in order to feed the body, and to survive.

Has this time come, gentlemen of the committee, in the matter of water supply for Washington? Indeed, can you foresee the time when it will be necessary to largely destroy a great natural area—the Potomac Valley—in order to survive? We of the Potomac Valley Coordinating Committee do not think so. But we most heartily commend the committee for beginning to study the problem, and we urge you to keep on studying it until we find the best answers humanly possible.

Mr. Chairman, at this time I should like to request that the record of this hearing be kept open for a reasonable time so that we can file with you our upcoming report.

Thank you.

IRA N. GABRIELSON.

COMMITTEE EXHIBIT

MEMBERSHIP, THE COORDINATING COMMITTEE ON THE POTOMAC RIVER VALLEY

OFFICERS

Chairman: Dr. Ira N. Gabrielson
Vice chairmen:
Stanley N. Brown
Arthur B. Hanson
Adm. Neill S. Phillips
Anthony Wayne Smith
Secretary: Charles J. Durham
Treasurer: Mrs. Andrew Parker

EXECUTIVE COMMITTEE

The officers and the following:
Elting Arnold
Washington I. Cleveland
Grant Conway
William J. Cox
Dr. William E. Davies
W. W. Rapley
Adm. Ralph S. Riggs
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Exhibit I. The Coordinating Committee on the Potomac

THE POTOMAC—PRIVATE OR PUBLIC

The Potomac today is one of the few rivers in the Eastern United States that belongs to the public. Throughout most of its length it is a river open to the public—the canoeist, the hiker, and the summer cottager and year-round homeowner. Several times in the past this untouched river basin has been the objective of the Corps of Engineers, first in 1933 as an elaborate flood-control and canalization project; then in 1946 as a vast power project. Now the corps is again after this rich plum. This time it is the same old plan dressed up in the form of water supply.

There are good alternatives to the plans of the Corps of Engineers for utilizing the Potomac Valley. The seven points cited here are for developing the valley for maximum public use; this is in contrast to other plans that enhance private government by bureaucracies and would post "Keep Out; Government Property" signs throughout the watershed.

Pollution.—Steps should be taken immediately to remove all pollution from the river. Partial abatement or control of maximum pollution by flushing, as advocated by the Corps of Engineers, is merely sidestepping the issue. Cost of full removal of pollution will be in the order of $400 million. This amount, at first glance, is large, but it compares well with the costs of the proposed projects of the Corps of Engineers for dams. In 1946, the cost for dams on the Potomac were estimated at $246,870,000. With increased costs of construction in the last 10 years, it appears that the dams would cost at least $500 million now. Since the bulk of the pollution entering the river is sewage, the major portion of the financing for cleaning the river should be borne by municipalities through the issuance of bonds to be paid out of sewer taxes plus Federal aid. Industrial pollution should be eliminated by those industrial plants causing it. As an incentive, State and Federal Governments should allow cost to be amortized at

an accelerated rate for tax purposes (H. R. 4134 expressly provides for this). Five years should be allowed for the removal of sources of pollution. Natural silting and flushing by the river will remove all traces of residual pollution within 3 to 5 years after complete abatement is accomplished. Building of dams will deter steps toward pollution removal. The huge costs of dams will leave no funds available for construction of proper sewage-treatment facilities. The Corps of Engineers plans call for keeping pollution at or just below the maximum tolerable limit by flushing. This is passed on to the public as cleaning up the river, but it is a far cry from elimination of pollution.

Water supply.—There is no shortage of domestic water supply for urban areas along the Potomac now or within the next 30 years. Since 1947, the flow of the river has been increasing constantly, and during the latest 5-year period for which records are available (1951–55) it is approaching an alltime daily high average of 8 billion gallons at Great Falls. This is in sharp contradiction to the idea that has been spread far and wide that the river is dropping rapidly in flow. Records since 1897 indicate no distinct change in flow characteristics, except for cyclical periods of drought. Average rainfall in the drainage basin has risen from 32.08 inches per year in 1947 to 37.59 inches in 1954. The overall average now is about 35.91 inches.

The absolute minimum flow ever recorded at Great Falls is 506 million gallons per day. From the figures given below, it is obvious that this minimum will adequately cover the maximum water requirements through 1980. In contrast, the minimum average flow (1952–56) of 1,144,600,000 gallons per day, and the average flow during a prolonged low period (August–November 1930) of 624 million gallons per day, will cover the maximum requirements beyond the year 2000.

Anticipated water demands

	1960		1980		2000	
	Average	Maximum	Average	Maximum	Average	Maximum
District of Columbia	164.4	242.3	179.4	265.6	181.4	268.3
Virginia suburbs	22.0	38.0	64.0	90.8	74.9	121.3
Maryland suburbs			31.1	49.1	77.7	119.0
Total	186.4	280.3	274.5	414.5	334.0	508.6

NOTE.—Figures are millions of gallons per day. Data from the Sanitary Engineer's Office, District of Columbia.

It is of interest that the consumption of water in the District of Columbia and Arlington has been decreasing in the past few years. The following table shows this:

	Average gallons per day	Maximum gallons per day
1952	174,000,000	236,900,000
1953	165,000,000	244,710,000
1954	165,620,000	262,960,000
1955	163,589,000	257,142,000
1956	157,145,000	253,044,000

If additional water is required during periods of low flow two sources are available. Numerous low dams in the headwater areas can be used to regulate the flow of the river. In addition, the large pool of fresh water between Washington and Indian Head, Md., can be used. In spite of all the blocks to pollution removal it is practicable to remove the pollution in this area south of Washington by 1980 by proper sewage treatment. Once this is done 52 billion gallons of fresh water, without the danger of salt encroachment, will be available for utilization during periods of extreme low flow of the river. This supply, if necessary, under polluted conditions, could be made available by construction of proper water processing plants at a cost of about $30 million.

Power.—It is erroneous to consider the Potomac as a source of continuous, full-time hydroelectric power. The flow of the river is not large enough for any significant production. In the Washington metropolitan area the present capacity from private steam plants is about 1,300,000 kilowatts. In addition there is a surplus 100,000-kilowatt plant maintained on a standby basis only. To this surplus should be added the 10 percent overload capacity of the operating steam plants. New steam plants now under construction or planned will take care of all foreseeable increases in the powerload. In comparison to the existing plants the power-generating capacity proposed for the River Bend Dam is 32,900 kilowatts firm capacity and 90,000 kilowatts maximum. This is not equal to the existing overload capacity yet it will cost the taxpayer at least $16 million for the hydroelectric plant alone. This low capacity and high cost does not justify the development of hydroelectric power on the river even as a source to meet peak loads. According to a recent statement of Colonel Summers, Corps of Engineers, it is questionable if the River Bend development can support the maximum capacity cited. In that case the firm capacity generated will serve less than 10,000 customers. Based on recent clamorings, most of these customers won't be in the Potomac Valley, yet the costs for the power will be placed on all the taxpayers.

Flood control.—The Potomac has suffered no serious widespread flood damage since 1942. This has come about because of natural flood-control conditions. After the 1942 flood little attempt was made to restore buildings and other structures in the lowlands. Strict zoning should be enacted by local governing bodies to prevent any construction in the areas of the bottom lands subject to flooding. In this way we can achieve 100-percent flood-damage elimination rather than mere flood control. To achieve this, approximately 5,000 structures, mainly in the upper parts of the Shenandoah River and the North Branch, ultimately will have to be abandoned. The cost of relocating these structures would be about $8 million. Only at Cumberland is there a major threat of flood destruction in an urban area where relocation or local protection by levees are not practicable. Here, by continuation of flood-control structures, as well as judicious slum removal in bottom areas without reconstruction—this menace can be removed at very low cost. All major bridges along the Potomac are now above flood levels. The greatest danger at present in the Potomac is from flash floods of mountain streams. Much of this danger can be eliminated by the removal of dwellings from the areas of wash aprons on which these floods develop and by limited construction of low dams in the mountain valleys such as have been constructed at Sherando Lake, Va., to impound the excessive flows developed by gully washes. These dams would be small and the normal low-level pondings would provide lakes for recreation purposes and would serve to maintain a relative constant flow of water in the river by releasing water as needed. Cost of the dams would be about $40 million, cost of relocation of structures $8 million, total cost of flood-damage elimination by letting the river use its flood plain as nature would have it, $48 million. Result: The river remains in its natural state with no inundation of valuable properties and no undue hardship on the taxpayer.

Transport.—The Potomac Valley is not a transportation gateway. Far better routes exist to the west through minor valleys that are ultimately tributaries to the Potomac. Routes along the river should be ruled out as they require greater distances, heavy construction, and do not intercept the larger urban areas that require access along the route.

Industry.—Industry has its place in the Potomac as long as it is so situated as not to utilize lands more valuable as recreation or farming sites. Industry should be encouraged to locate in areas of poor soils. Local zoning should require that no industrial installations be allowed on the bottom lands subject to flood. Plans for all industrial installations should be required to include adequate prevention of pollution. Where an increase in population is anticipated from an industry, proper control should be effected by local zoning to prevent community development in areas subject to flood and to prevent the development of pollution through inadequate sewage facilities. Because of the narrow valley along the main branch of the river, industry should be discouraged from locating immediately adjacent to the Potomac from Hancock to Cumberland.

Recreation.—Immediate steps should be taken to provide adequate recreational and conservation facilities throughout the whole of the Potomac. This is extremely urgent in view of the failure of metropolitan Washington, in contrast with other metropolitan areas, to provide even a minimum of proper recreation facilities in its poorly planned expansion. The building of dams will not pro-

vide recreation facilities along the river immediately adjacent to Washington; only pollution removal can do this. The dams would wipe out most of the proposed National Park Service development from Washington to Cumberland. The National Park properties from the proposed dam at River Bend would be wiped out as far as Weverton. The successive dams upstream would flood comparable stretches now planned for public recreational development under bills proposed by Representative Hyde and Senator Beall of Maryland.

Equally pressing is the need for increased recreation areas brought about by the failure of the President's highway program to consider the impact on rural areas by the construction of the highways. One would be naive to think that the new highways will be used only for intercity travel. The load of urbanites seeking recreation dumped on an ill-prepared rural environment will be such that only chaos can result. This is a national problem that can be solved only by providing great increases in funds for State and National parks. To get this money Congress and each State should add a cent more to the gas taxes (2 cents total) and the money be earmarked by law for expenditure on recreation and conservation. In addition, Congress should enact requirements that for each mile of road built under the President's program, 1,000 acres shall be set aside for conservation and recreation lands. Of this amount one-half should be developed to the fullest extent possible for recreation purposes. This alone will barely provide for the anticipated increase in patrons of the outdoors. In addition, it will accelerate completion of holdings under the national-forest plan. In the Potomac this would add 500,000 acres to the park and forest system. The cost, $20 million, which could easily be met by the gasoline tax in 2 years.

Steps should be taken to improve the acquired lands for public use. Those parks now available in the Potomac area are so inadequate that they are just barely of use to local residents only. Sherando, instead of being a national-forest facility, is in reality the private park of the residents of Staunton and Waynesboro. Elizabeth Furnace is Front Royal's gift from the National Forest Service. Cacapon State Park, a West Virginia holding, is overcrowded by Washingtonians who have no place else to go. To provide adequate acilities, 13 parks, at a cost of $20 million should be established or expanded in the Potomac Basin. Immediate steps should be taken to provide full or expanded recreation facilities at the following points: Big Pool, Md. (National Park Service); Catoctin, Md. (National Park Service); Monocacy River near Point of Rocks, Md. (State); Seneca State Park, Md. (State); Home Quarry, Va. (National Forest Service); Elizabeth Furnace, Va., (National Forest Service); Difficult Run, Va. (State); Goose Creek, Va. (State); Sugarland, Va. (State); Accotink Creek near Annandale, Va. (State); the Smokehole, West Virginia (National Forest Service); the Trough, W. Va. (State); beaches along the Potomac when pollution removal is realized (District of Columbia and State). In addition to providing recreation facilities these developments can also serve as reception centers or Government office facilities in case of national disaster brought about by war.

Provision for retention as absolute wilderness areas should be made for the following: Cacapon Valley north of Capon Bridge to the Potomac, 250 square miles; Potomac Valley, Hancock, Md., to Pawpaw, W. Va., 300 square miles; headwater area of North Mountain and Shenandoah Mountain, New Market to Staunton, Va., 600 square miles; North Branch above Keyser, W. Va., 400 square miles.

THE ARMY ENGINEERS HEARING DATES ON RIVER BEND DAM

June 25—auditorium of the Richard Montgomery High School, Rockville, Md., at 1:30 p. m., daylight saving time; June 26—auditorium of the Fairfax High School, Fairfax, Va., 1:30 p. m., daylight saving time; June 27—auditorium of the new Department of Interior Building, 19th and C Streets NW., 10 a. m., daylight saving time.

THE COORDINATING COMMITTEE'S PROGRAM

The program of the Coordinating Committee on the Potomac Valley includes the following points: No dam below Harper's Ferry; no dams for hydropower; low dams on Potomac headwaters' tributaries for local domestic use and flood control; a clean Potomac through complete sewage treatment; augmented water supply for metropolitan Washington to be obtained from river

between Little Falls and Indian Head, Md., after proper raw water treatment; preservation of the Potomac River gorge and the entire Chesapeake and Ohio Canal.

FACT SHEET—POTOMAC RIVER

A. Flow at Great Falls (gallons per day)

1. Minimum recorded (August 25, 1930)	506,000,000
2. Minimum average for prolonged period (August-November 1930)	624,000,000
3. Average flow	7,500,000,000
4. Average minimum flow	1,144,600,000

Source: U. S. Geological Survey stream gaging records.

*B. Fresh water in Potomac Estuary**

1. Highest point brackish water observed—Indian Head, Md.
2. Maximum saline content at Indian Head (1930), 3,700 parts per million.
3. Maximum saline content that can be processed for domestic consumption. (United States Public Health Service Specifications), 4,000 parts per million.
4. Minimum volume of fresh water, Washington-Indian Head, Md., 52 million gallons.

C. Flow trend 1901–55 (average flow in million gallons per day) at Great Falls

1901–05	8,350	1931–35	6,260
1906–10	8,030	1936–40	8,225
1911–15	7,050	1941–45	6,940
1916–20	7,030	1946–50	6,850
1921–25	6,200	1951–55	8,091
1926–30	6,460	Average flow 1897–1955	7,325

Source: U. S. Geological Survey stream gaging records.

D. Precipitation trends 1947–55 (in inches) in Potomac Basin

Average annual precipitation up to 1947	34.81	1951	39.92
1947	32.08	1952	42.62
1948	44.70	1953	34.98
1949	40.01	1954	37.59
1950	38.25	Average annual precipitation through 1954	35.91

NOTE.—Data from spot stations (Cumberland, Moorefield, Franklin, Staunton, Luray, Winchester, Hagerstown, Rockville) as published in U. S. Weather Bureau Climatic Summary.

E. River Bend Dam

1. The River Bend Dam would be 119 feet high.
2. It would create a reservoir extending 36 miles to Weverton, Md.
3. It would have a surface area of 42,600 acres at flood crest and 36,000 acres at normal pool level.
4. All land along the river valley below elevation 247 feet above mean sea level would be taken by the Government.
5. At flood crest (246 feet above sea level) the reservoir would inundate 34,900 acres, exclusive of the area in the river channel—approximately 18,500 acres being in Maryland and 16,400 being in Virginia, and it would inundate 28,300 acres at normal pool level (235 feet above sea level), approximately 15,000 acres being in Maryland and 13,300 being in Virginia.
6. The draw down during periods of low river flow in summer months would be as much as 30 feet, exposing as much as 13,000 acres of mud flats.
7. At least 13.3 miles of highway and 8.7 miles of railroad would be inundated.
8. Hydroelectric power would be generated at the dam, but such power would not equal the overload capacity of existing private steam plants.
9. 34,900 acres of high-level residential and agricultural land valued at $17,450,000 would be forever lost for gainful use and loss of annual tax revenue would be $384,800.

*Source: Volumes calculated from U. S. Coast and Geodetic Survey charts 559 and 560. Extent of fresh water from U. S. Geological Survey, Quality of Water Branch, open file report on Fort Belvoir area, 1956.

10. Estimated cost of dam (1957):

	From—	To—
Land, removal of structures	$53,000,000	$85,000,000
Dam and power plant	31,000,000	50,000,000
Highway and railway relocation	13,000,000	15,000,000
Total	97,000,000	150,000,000

NOTE.—Based on Construction Price Index (1956), Engineering News Record.

11. Water stored at Pool Height 246 ft. 492,000,000,000 gallons.

Representative HYDE. Before you go on with that, I wish you would, in connection with this problem of the dam that you spoke about a moment ago, can you give the committee any idea of the value of the land, on a per acre basis, that would be inundated by the dam?

I know on the Maryland side, the value of the land ranges from $2,000 to $3,000 an acre, and much of the land would be flooded.

How does that compare with the value on the Virginia side?

Mr. BROWN. It would vary greatly, of course, as there are certain developments, subdivisions, and so on, where the unit price per acre would be as high as that, if not higher.

Most of it, I would say is farmland. I had an occasion just this last year, the state highway commission condemned certain lands on the farm that I own which borders the Potomac, and in doing so, their appraisers, for all of the properties to be condemned, first they approached it by making an appraisal of the farm as a whole, including land and buildings, and the proportion and all that, and so forth. In my case, the figure came out close to $1,000 an acre. I think that that is representative of a goodly portion of it.

Now in certain areas, the value per acre would be substantially less than that.

As I say, that is not based on pure land values alone. You have to consider the structures that are there.

In my own case, I would say that the structures were comparable to farms for several miles up and down.

Representative HYDE. And if it has been subdivided it would be higher?

Mr. BROWN. Yes, very much higher.

Representative HYDE. Thank you.

Mr. BROWN. So I will just read a few of these pertinent paragraphs.

Our group, the Coordinating Committee on the Potomac River Valley came into existence last June 6th, and at the initial meeting there were some 85 conservationists, scientists, lawyers, investment bankers, architects, realtors, homeowners, and similar professional people and citizens represented. At least 25 organizations were informally represented. And this group believes that alternative methods to storage in huge dams on the main stem of the Potomac have not been fully explored. We ask that this be done.

The group's platform, was, and remains essentially as follows, and it is covered by seven points, which I should like to read.

1. No dams are necessary in the Potomac below Harpers Ferry, or, indeed, on the main stem of the Potomac.

2. On the basis of any reasonable planning, dams on the headwater tributaries of the Potomac above Harpers Ferry could im-

pound all the water that will ever be required for domestic use by communities in the areas downstream, store water for flood control and insure a more uniform river flow throughout the year. Experience has show that plans for more than 50 years are unreasonable, since technical advances outmode even the most farsighted plans. And plans for 200 years would seem to be rather on the fantastic side.

3. Hydroelectric power should not be generated at any future dam in the Potomac Basin.

4. The solution of the problem of a contaminated Potomac River is proper and complete treatment—by better techniques than now used—of all sewage emptied into it and its tributaries; and to prevent future pollution.

In this day and age, pollution of our streams and rivers—especially the Nation's river, the Potomac—is intolerable in any kind of civilized society.

5. Construction of a dam at River Bend would forever remove from gainful use and tax revenue 35,000 acres of high-level residential and agricultural land, destroy 42 miles of the Chesapeake and Ohio Canal; and eliminate the incentive for cleaning up the lower river, inasmuch as it would substitute flushing for pollution control, instead of providing for the complete removal of the causes of pollution.

6. During periods of protracted drought, augmented supplies of fresh water required for domestic use by the metropolitan area of Washington can be obtained from the estuary of the Potomac River, with proper raw water treatment.

7. The present beauty and cathedral wilderness of the Potomac River Gorge and the priceless historical and recreational values of the Chesapeake and Ohio Canal should be preserved for posterity. The Canal area is the only assured potential for expansion of recreation facilities in the metropolitan area, and, as such its value is inestimable. The Potomac River Valley means to the residents of the metropolitan area what Rock Creek Park means to the residents of the District of Columbia.

Representative HYDE. Mr. Brown, I appreciate that paragraph 7. I will use it verbatim in my testimony before the Interior Committee.

Mr. BROWN. I should like most heartily to commend this committee in its attempt to come to grips with the problems of our complex, technological age as it is reflected in our sprawling metropolitan areas.

These problems have got to be met, and it is a heartening sign that the Congress is taking such great interest in them.

We wish a long life for your committee, or, at least, enough time and resources to take a good, hard look at these things, and to inform our citizens about them in every way possible.

The Coordinating Committee on the Potomac River Valley is continuing to study the problems facing the river basin; as a matter of fact, here is a rough draft of a report that is in preparation.

The No. 1 problem, of course, is the question of pollution.

There is one engineer who puts his finger on the pollution—he is Mark D. Hollis, Assistant Surgeon General of the United States Public Health Service.

In a speech last year before the Citizens Committee for a Clean Potomac, he pointed out that public opinion will dictate the kind of river the country wants for its National Capital. It will cost a great

deal; that goes without saying. We have the engineering ability to clean up the river. The question is: Do we want to?

Our reply, Mr. Chairman, is that we do want to.

Skipping again to the reports of your committee, the Joint Committee of Metropolitan Area Problems, we have examined them and, while we do not agree with some of the basic conclusions reached by your consultants, we should like to compliment your committee and its staff upon its industry.

Now, we would like to turn to the water supply of Washington.

The estimate cited for "pollution requirements," is admitted in Mr. Levin's report:

> * * * not firmly established, as much remains to be learned about the capacity of the river to assimilate pollution.

That is the quotation.

It would appear that the estimate of 950 million gallons per day by 2000, and 2 billion gallons per day by 2100, assume that there will be no improvement in methods of sewage treatment for the next 142 years.

Mr. Levin states, at the bottom of page 18 that:

> It is obvious that a return of the low flow conditions of 1930 would confront the residents with a dilemma. It would be necessary either to invoke water use restrictions or to permit unpleasant and dangerous water pollution to occur in the metropolitan reach of the Potomac River. The net water deficit would be 380 million gallons per day during the low flow period.

Another way of stating the problem is that the flow available to dilute pollution would be 650 minus 380, equals 270 million gallons per day instead of 650 million gallons per day, an amount which Mr. Levin has already stated on page 6, "is not firmly established."

What Mr. Levin neglected to state is that the low flow of 506 million gallons per day occurred only once in 50 years.

Is there anything wrong with imposing restrictions on the use of water for carwashing or watering lawns once every 50 years?

Bear in mind, again, the average flow of the river is 7.5 billion gallons per day.

The figure cited for water needs by Mr. Levin in a report on water supply for the year 2000 contains a lot of luxury items.

The base of 650.1 million gallons per day for domestic use of metropolitan Washington is acceptable. Six-five-zero, or more, additional gallons for pollution flushing is a luxury. Mr. Levin backs pollution removal and, on the other hand, advocates flushing.

Another luxury is the acceptance of uncontrolled, unlicensed irrigation. As these luxuries for pollution flushing and irrigation are reduced to a minimum, the need for massive impoundments costing hundreds of millions of dollars can be reduced to reasonable limits, or eliminated.

The 650.1 million gallons per day maximum needed for domestic water, when the absolute minimum of 600 million gallons, including Patuxent and Occoquan sources, is available, can be met from the estuary, if reasonable advances in pollution removal and acceptance of new sewage-disposal techniques are used.

The use of the estuary, combined with reasonable licensing and cost payments for irrigation water, will eliminate the costly impoundment necessary for the luxury of irrigation.

These luxuries will cost $236 million at a minimum. This money would give far bigger returns if applied to cleaning up the estuary of the Potomac, by complete separation of all sanitary and storm sewers in the District of Columbia, and by using new techniques for purification of effluents.

We feel strongly that Mr. Levin has failed to emphasize the luxury costs of pollution flushing and uncontrolled irrigation, especially in the light of the fact that the low flow for which the provision for impoundment is needed occurs only about once in 50 years.

He has also failed to include in his study any serious alternates to large-scale impoundments.

We advocate that studies of all alternate means receive the fullest consideration.

It is completely unacceptable to us to assume that sewage effluent containing contamination should be returned to the Potomac River for the next 142 years—and possibly for all time.

Also in Mr. Levin's report, I would like to point out that there are some misleading statements, such as, for example, the one on page 20.

The error lies in the wrong use of the word "stored."

Mr. Bird uses the figures correctly in his paper presented at the Chesapeake section of the American Waterworks Association meeting in October 1957, which is, apparently the source for Mr. Levin's figure.

The term should be "cost of million gallons of water used," based on cost of operation, maintenance, and amortization.

While technicians may be able to guess at what is meant, the general public would not, and could possibly be misled.

That covers, I believe, Mr. Chairman, the high spots except for the concluding paragraph, where Mr. Gabrielson says that I would like to request that the record of this hearing be kept open for a reasonable time so that we could file with you our upcoming report.

Representative Hyde. We shall be glad to do that, to comply with that request, Mr. Brown.

Mr. Brown. Thank you, sir.

Representative Hyde. Mr. Brown, what is the composition of this coordinating committee? I don't know whether you said it at the start or not.

Mr. Brown. Yes.

There are about 85 members in the organization group, and I have the list of those at this time. I will be glad to submit those for the record.

Representative Hyde. We will be happy to have you do so, sir.

Any questions?

Mr. Levin. Yes.

I wonder if Mr. Brown would be in position to answer some of the questions directed at Mr. Gabrielson's testimony?

Mr. Brown. I doubt I have the capacity. I can't fill Dr. Gabrielson's shoes, but I can try.

Mr. Levin. It seems to me that in terms of water supply, we all must agree that a certain given amount of water is necessary for the Washington metropolitan area. Let's call it "C", as a quantity of water.

You have stated that one of the main reasons you would oppose the construction of a dam and reservoir would be the inundation of some

35,000 acres of land. If you agree, if we can all agree to this figure "C" of the gallons of water that are required, and it is indicated that the only way to guarantee the supply is through storage, would you not then be in agreement that the best way to accomplish this is to store the water in a manner that will inundate the least area possible?

Mr. BROWN. That is a pretty long question to answer, but I am afraid I wouldn't agree.

In the first place, I wouldn't agree on the permises you set up and secondly, it might not follow at all that the lowest costs or the most satisfactory result would be obtained where the lesser area was flooded, and finally, there is this hazard I mentioned to you first which might transcend all other considerations.

Mr. LEVIN. Then you take back your earlier statement that the chief objection is the quantity of land that would be inundated?

Mr. BROWN. Yes, if I said that as the chief objection I shouldn't have said so. I didn't mean to imply that. I mentioned that that was a fact, that Loudon County, as a county was primarily concerned from that point of view, but as a citizen of the United States, I personally look at from a much broader point of view than just that.

Mr. LEVIN. You mentioned that my report is apparently contradictory and that it advocates a clean Potomac and still mentions the quantity of water that would be required for your term "flushing of sewage."

Mr. BROWN. Well, it seems so to us.

Mr. LEVIN. I would like, then, not to ask questions, but to make a statement in that regard to see if I could clarify your thinking on this matter.

Mr. BROWN. Thank you.

Mr. LEVIN. Sewage treatment by the best means known to date does not produce a product that can be consumed with impunity.

The product of a sewage-treatment plant is contaminated, no matter how high the degree of treatment, this is by present degrees of treatment, and by any foreseeable economic degree of treatment.

A river can assimilate certain quantities of sewage without developing objectionable characteristics. If we hold this quantity low enough, the river by dilution and natural processes of aeration and sunlight, will be able to assimilate a given amount of sewage.

Now certainly, I do not for a moment predict that there will be no advances in the art and science of sewage treatment in the next 150 years. As a matter of fact, I am working on some methods which I hope eventually can improve sewage treatment, but I can guarantee this to you—no matter what kind of sewage treatment process is developed, the communities utilizing them will utilize them to the best economic advantage possible.

Therefore, the capacity of the river below that load which will make conditions objectionable will be utilized. So we are not talking about developing any method that is going to make sewage disappear.

The only way I can conceive of this is putting it in orbit, outside the planet, as we see in the papers the other day, this might get congested.

So you have an end product that must be put some place, and this end product by no stretch of the imagination, for an economic process, can be made sterile.

Mr. BROWN. I would just like to add to that a great many things have happened in the last 200 years which were beyond the stretch of the imagination of those persons living during the past 200 years. And I shouldn't be at all surprised that a totally different method of sewage disposal might be just around the corner.

Mr. LEVIN. I would be surprised. You also stated that this low flow occurred only once in 50 years and, therefore, this is not too much to ask that we curtail lawn watering once in 50 years.

Unfortunately, nature does not comply with the statistical pattern which we would like to set forth. The frequency as we know it to date, and we only know it for 50 years, that is the only record upon the river, that this has occurred once. This means that it may occur tomorrow—it may occur 3, 4, 5 times in a row, or may not occur again for several hundred years.

We don't know what the exact frequency is. We know that it has occurred once in 50 years. Now, we know what the consequences could be, and we therefore rule out, as best man can, the element of chance by taking precautions against that.

One final comment—you refer to the luxury of irrigation. I certainly don't hope that you believe it to be a luxury. The present population explosion which we are discussing in the metropolitan area is not restricted to the metropolitan area of Washington, or it is restricted to the United States. It is a worldwide phenomena that is increasing a a frightening rate in terms of getting food to feed this population.

Irrigation can produce as much as, and you prabably know better than I, twice as much crop per acre of land, when scientifically developed.

This then is no longer irrigation when food supply comes into short demand. This will no longer be a luxury, nor is it a luxury in terms of economic income, in terms of the farmer who should be able to practice irrigation, and I should say comparing that to the 230—or whatever the figure of millions of dollars was that you cited for the cost of that, it seems to me that this would not be an excessive amount to pay for food.

Representative HYDE. I just can't avoid a comment right here. And that is that this population explosion, regardless of the difficulties, is about the only solution I see to the farm problem. [Laughter.]

Mr. BROWN. May I make a reply to that, to Mr. Levin's comments?

Representative HYDE. Yes.

Mr. BROWN. I do happen to know a little bit about irrigation, as I have been farming in this particular location for 11 years.

I spent last Friday and Saturday plowing.

My next door neighbor, Mr. Ellis Mills, testified at the Corps of Engineer hearings, I think on the second day, with respect to an irrigation system that he had put in.

I should like to refer you to his testimony in that case. In substance, he says that he tried it—had used it decreasingly, found that it really didn't pay, and put it up for sale, and there were no takers.

Of course, that applies to this particular area with the rainfall conditions as they are. What you said about irrigation certainly applies in the more arid sections of the United States. It applies to a much lesser degree here. It is true that in a few drought areas you

will have handsome returns on your irrigation, but on the other hand, here this 1 dam would take out something like 35,000 or 40,000 acres of the most productive land, take it entirely out of production every year, and I think that that should be carefully considered when you talk in terms of explosive population growth.

It is far better to keep that area in production, if possile. And we hope that by new technology and new methods, a way will be found and we think it is possible.

Mr. LEVIN. You prefer to wait, even though it might be too late?

Mr. BROWN. Oh, no, no. I think we should take steps at the proper time. I don't think it is necessary to take a step at this time and spend the money on the assumption that there will be no technological advances for the next 150 years, and spend the amount of money that is required for a 50-year job, if you see what I mean.

Mr. LEVIN. Well, what do you do now?

Mr. BROWN. That is not quite ready for a statement. It will be contained in this report we are talking about. I wouldn't want to mislead anyone by stating something that was inaccurate.

Mr. LEVIN. Thank you.

Representative HYDE. Thank you very much, Mr. Brown.

The next witness will be Mr. Arthur Keyes.

STATEMENT OF ARTHUR H. KEYES, JR., CHAIRMAN, SUBCOMMITTEE ON METROPOLITAN WASHINGTON WATER PROBLEMS, CITY PLANNING COMMITTEE, WASHINGTON BUILDING CONGRESS, INC.

Mr. KEYES. I am Arthur Keyes. I am appearing here as chairman of the subcommittee on metropolitan Washington water problems, city planning committee, Washington Building Congress.

You have heard a lot of testimony today from experts and officials who are of the agencies connected with the sanitary problems. We want to make it very clear that we are not the experts. We are a civic organization, and our interest has been in trying to determine for ourselves what we think the proper solution to the problems of the Potomac Basin are, and then turn to the experts and find out what is the best solution to those problems to meet our objectives.

The conclusion of the Washington Building Congress drawn from the 3 staff reports prepared for the Joint Committee on Washington Metropolitan Problems is that there is need for 1 agency with adequate responsibilities and enforcement powers to deal with the conservation, recreation, sewage, and water problems of the Potomac River Basin as an entity. The problem, of course, is how to create such an agency in a manner which will insure a balanced and fair resolution of the conflicting interests and ambitions now working at cross-purposes in the Potomac Basin, and which will insure sound long-range planning compatible with the national importance of the Potomac and its unique assets.

The Washington Building Congress at present envisions a new regulatory body with broad planning and enforcement powers, rather than an authority with construction and operating responsibilities.

However, for the present, we have confined ourselves to the Bible committee reports already prepared, and plan to consider organizational problems next.

POLLUTION CONTROL

It is evident, although not obvious, from the data contained in the three staff reports, as well as United States Army engineer reports and others, that there is no imminent water shortage confronting the metropolitan Washington area as far as water consumption is concerned and will not be for many years to come. However, a water shortage already exists if we are to rely on the Potomac to assimilate all the raw or treated sewage effluent being poured into it now or indiscriminately in the future. Therefore, the great efforts being made now to construct more secondary sewage treatment plants in the metropolitan area is a step in the right direction but unfortunately the efforts lack the overall coordination essential to future success.

The Washington Suburban Sanitary Commission, the city of Rockville, the Corps of Engineers, and other agencies continue optimistically with their projects to tap the Potomac for drinking water, apparently in the belief that somehow with a bit of good luck contamination from up-river sewage disposal is going to be eliminated.

The solution to contamination, which is the major problem of the Potomac River, we believe, is simply the proper and complete secondary treatment of all sewage emptied into it and its tributaries so that minimum flushing water is needed. And perhaps no flushing water at all.

This, among other things, involves:

(a) A properly coordinated sewage-treatment program employing the most modern, effective secondary reatment facility in up-river communities as well as down river. And I might add in the estuary we would recommend the distillation process as a further treatment.

(b) Providing relief sewers, pumping stations and force mains, and some separation of sanitary sewage from storm drainage in all communities so that overflow of raw sewage into the river will not occur.

(c) Prevention of contamination from private sources, such as industrial installations and housing developments, by enforcement powers granted to a Potomac Basin Authority.

Senator MORSE (presiding). Would you mind my interrupting to ask one question?

Let's assume this hypothetical program you have just outlined is adopted and we have it in effect. Will that program make possible the use of the Potomac River for recreational purposes?

Mr. KEYES. Yes, sir.

Senator MORSE. Can you swim in it?

Mr. KEYES. Yes, sir.

Senator MORSE. Boat on it?

Mr. KEYES. Yes, sir. What we think we deserve and what the city ought to ask for and what the Federal Government ought to insist upon is a clean Potomac. I do not think there is any other solution.

A half-clean Potomac is a waste of money. A clean Potomac is technically possible, and financially possible if that is what we want.

Senator MORSE. I want to say that your testimony makes me very happy indeed if this is the program that will accomplish it. You speak about its being technically possible and physically possible. I want to add that it is socially necessary. I just do not think that this Nation can justify the horrible example of the Potomac River.

Mr. KEYES. I am very happy to hear you say that, Senator.

Senator MORSE. I just do not think Virginia and Maryland can justify the horrible example of the Potomac River.

Mr. KEYES. I agree.

Senator MORSE. Unless some river has outstripped us—and my distinguished colleague over here on my right who was so helpful to me 2 or 3 years ago in our survey of the Potomac River can correct me if I am wrong for I think he supplied me with the data at that time—that for its size the Potomac is the most polluted and dirtiest river in the world.

The Federal Government, the Maryland government, the Virginia government in my opinion cannot justify it; when you think of the value of that asset for recreational purposes alone, we cannot justify our failure, in the two States and in the District of Columbia through the Federal Government, to raise the funds necessary to give us the type of a program you have just testified to here which would give us a clean river. I just happen to be one of those strange politicians who thinks his job is to translate into legislation great moral and social values. Here is one that hits us right between the eyes, while we are letting alleged economic reasons, pennypinching reasons or industrial reasons deny to our oncoming generations of boys and girls the use of that great stream for recreational purposes. I think that for recreational purposes alone, the expenditure which your program would call for, if it would accomplish the results you testify it will accomplish, would be exceedingly cheap. I do not customarily take time out to comment on a witness' testimony, but your testimony I find so inspiring, if you can accomplish what you say in points (a), (b), and (c), that I want the record to show at the outset I am for it, and the quicker the better.

Mr. KEYES. That is fine.

It is the kind of perspective on the problem that we hope will be brought to bear by whatever authority or commission or group will be faced with the decision.

I come now to water supply. Although there is no water shortage as such, we believe that to insure adequate water for community and industrial activities in the future, as well as farm irrigation in the upper valleys, if the farmers wish it and to prevent floods and water wastage, provision should be made in the future for certain storage dams in the upper tributaries of the river.

1. RIVER BEND DAM

There are certain interests and certain agencies hoping to increase our water reserves by means of a large dam at River Bend. The Washington Building Congress is unalterably opposed to such a dam because:

(*a*) It could provide no benefits not better provided by tributary dams, except a small amount of hydro-electric power (estimated optimistically at 39,000 kw. dependable capacity). This would have to be backed up with steam power because of the irregular flow of the Potomac, and because the power generation would interfere with proper water conservation during the dry summer months when the peak electrical load in the Washington area occurs.

(*b*) On the other hand, construction of a dam at River Bend would forever remove from gainful use and tax revenues 34,900 acres of high-level residential and agricultural land, destroy 42 miles of the Chesapeake & Ohio Canal, and flood 13.3 miles of highway and 8.7 miles of railroad.

(*c*) The drawdown during the dry summer months would be as much as 30 feet vertically, exposing about 10,000 acres of mud flats. To argue there are ways of limiting this drawdown to 10 feet is merely to admit a high dam is not needed. Any extensive exposure of mud flats would destroy recreational opportunities, rather than preserve or enhance them.

(*d*) The dam would eliminate the incentive for cleaning up the lower river inasmuch as it would substitute flushing for pollution control instead of providing for the complete removal of the causes of pollution.

(*e*) The present beauty and cathedral wilderness of the Potomac River Gorge and the priceless historical and recreational values of the Chesapeake & Ohio Canal and towpath would be lost to posterity.

(*f*) The proposed River Bend Dam is far larger than needed, now or in the future. A single multipurpose high level dam at River Bend is capable of storing approximately 1,110,000 acre-feet or 360 billion gallons of water. This is a tremendous quantity of water.

In the year 2000, when the daily water requirement of metropolitan Washington is estimated at approximately 600 million gallons or 4 times the present daily consumption, the water impounded behind the River Bend Dam would provide all the city water requirements of metropolitan Washington for nearly 2 years, 600 days to be exact, with no additional water whatever coming down the river during this 2-year period.

This assumes, of course, that by the year 2000 we will have an adequate secondary sewage disposal system so that the treated water will or can be returned to the river to maintain proper flow.

(*g*) There are two other weaknesses in consolidating the city water supply of metropolitan Washington into a single dam and reservoir project at River Bend. These weaknesses are, for the most part, associated with wartime conditions. First, the contamination of this single reservoir with radioactive material or dangerous bacteria could cause a critical water shortage. Second, if the River Bend Dam should be destroyed by enemy action, the Washington area would experience a devastating flood. While these two contingencies may be remote, they are by no means impossible and should, therefore, be considered.

2. NUMEROUS SMALL DAMS

For all these reasons, the Washington Building Congress believes that if impoundment becomes necessary the overall objectives of flood control and adequate water supply for all purposes can best be achieved by means of numerous small earth dams on the upper headwaters of the Potomac which could be built over a period of years as needed to serve the Potomac Basin as a whole.

These could be located principally on undeveloped or public land and could probably be built at less overall cost than one great dam, considering the high cost of the land and improvements which the

big dam would inundate, as well as the greater cost of the high, reinforced concrete dam.

These impoundment dams do not need to be located on the main stem of the Potomac nor on the main branches as such dams could not prevent flood damage in the upper basin nor provide irrigation water where it is needed.

By proper regulation of these smaller dams the dry season flow past the Washington metropolitan area could be regulated to an amount capable of providing adequate water at all times and of preventing stagnation, siltation, and accumulation of surface debris in the metropolitan area where the river meets tidewater.

Furthermore, siltation and waste of topsoil, which is one of man's most shortsighted abuses of nature, should be reduced by enforcement of proper land and watershed management practices and encouragement of reforestation and cover crops by the proposed Potomac Basin Authority.

It is essential also that all water users be taxed fairly—irrigation farmers and industrial users as well as individual city dwellers. This in itself will conserve water.

FINANCING

Cleaning up the Potomac and providing adequate water for the millions of people who will be living in this area a hundred years from now is no small undertaking. The suburban areas with their spectacular growth, complex structure of political subdivisions, and large tax-exempt Federal holdings, have difficult problems to overcome in financing needed water and sewer facilities. Recent awareness of these problems and major efforts to solve them are an encouraging indication that a strong joint effort can be successful.

The heart of the problem, however, lies in the District of Columbia itself. Washington is the Nation's showcase city and the Potomac is the Nation's river. For these reasons, and because it occupies—tax free—such a large portion of the metropolitan area, the Federal Government has an undeniable responsibility to assist in cleaning up the Potomac and providing adequate water for many years to come.

ACTION NEEDED NOW

The water and sewage problems of the Potomac Valley have been studied in detail and at great expense for over 20 years, usually by single-purpose specialists.

Meanwhile, little has been done to insure proper coordination of the various river uses. We believe the time has now come for some policy decisions and some positive action.

We earnestly hope that the Joint Committee on Washington metropolitan problems, which is well qualified to review the facts impartially, will next develop a positive program for the creation of an effective Potomac Basin regulatory and planning body. Such a proposal, with alternate proposals as the case may be, should preferably be in a form which can be acted upon by Congress, and on which hearings can first be held.

We look to the Joint Committee on Washington metropolitan problems for action not only because Congress itself represents the

Federal interest in the Potomac River, but because it represents the government of the people of the District of Columbia who are vitally concerned in this matter and yet helpless to act for themselves.

Representative HYDE. Thank you very much, Mr. Keyes. What is your concrete suggestion for the Federal Government's participation in what you call its undeniable responsibility? I assume that is money for treatment plants, is that it?

Mr. KEYES. We think that it should share in the expense of providing pure water and providing a clean Potomac. That can be done by an appropriation to supplement the funds needed for such a project.

It might also be done by taxing the Federal Government's use of the water as other people are taxed. I do not know which would be more palatable to the Federal Government, but those details I believe could be worked out.

Representative HYDE. Now getting back to the question of dams, I take it that your objection goes to all dams on the main stem of the Potomac, high or low.

Mr. KEYES. Yes, sir. We are of the opinion from the information that we have available, that no dams are needed on the main stem of the Potomac. Let's say certainly not below Harper's Ferry, and probably not even above there.

We believe, and this forthcoming report which is being prepared with the help of experts from the United States Geological Survey, will indicate, I think, that there are areas in the mountainous regions, the headwaters of the Potomac, adequate to impound all the water that will be needed for over a hundred years.

Representative HYDE. What report is this, Mr. Keyes?

Mr. KEYES. This is the report mentioned by the previous person testifying.

Representative HYDE. Mr. Brown?

Mr. KEYES. Mr. Brown, and is being prepared by the Coordinating Committee on the Potomac River Valley. As I understand it at the moment, it is being edited and will be printed soon.

We have reviewed that report.

Representative HYDE. I think it is also interesting to note at this point so far at any rate, that most everyone concerned with these problems thinks that there ought to be, as you have suggested in your report, an effective Potomac Basin regulatory planning body, except those persons who are now engaged in planning and regulating.

Mr. KEYES. Yes, sir.

Representative HYDE. Mr. Gutheim, do you have any questions at this time?

Mr. GUTHEIM. Mr. Keyes, did the Washington Building Congress consider the several alternative proposals for the creation of a basin-wide planning agency that were authorized by Mr. Bernard Frank in his report entitled "Metropolitan Water Problems"?

Mr. KEYES. We discussed that for a brief period of time, yes, sir. We originally thought that we would endorse what I believe is the third recommendation, that is, to strengthen the existing Potomac Basin Commission.

Mr. GUTHEIM. The Interstate Commission on the Potomac River Basin?

Mr. KEYES. Yes. We decided that rather than mention that, which would seem to be the most logical way to go about it, we would simply say that we would hope for a regulatory body which would represent all the interests in the basin, and would arrive at impartial and balanced conclusions regarding use of the river and the valley.

Mr. GUTHEIM. In other words, you content yourself at present with identifying what needs to be done without endorsing a specific way of getting at the job?

Mr. KEYES. Yes, sir; we do not have the information at the moment to reach a conclusion on that, and it would seem to be a proper subject for perhaps further study by your committee, and then further hearings.

Mr. GUTHEIM. Our consultants feel, as you probably know, that all the problems of the basin as a whole have a very real impact upon the metropolitan problem, but that dealing with them would require a somewhat different instrumentality of a representative character and with a different expression of the Federal interest than would exist in the metropolitan area where the affairs of the District of course occupy a larger concern.

I have no further questions.

Representative HYDE. Mr. Levin.

Mr. LEVIN. You mentioned, Mr. Keyes, that you hoped that secondary treatment would soon be the general rule on the Potomac River in this area, and therefore would eliminate the quantity of water that was required for the so-called flushing operations?

Mr. KEYES. Yes.

Mr. LEVIN. The effluent from secondary plants still requires further dilution before it can be rendered relatively innocuous?

Mr. KEYES. I realize that.

Mr. LEVIN. You stated that perhaps a method that should be considered in respect to this is distillation of the sewage?

Mr. KEYES. Yes.

Mr. LEVIN. By virtue of the fact that despite Mr. Brown's comment that I did not seem to anticipate changes in technology, by virtue of the fact that I have suggested a new method of purifying sea water to the effort of saving waters, last week I testified and attended the hearings of the Senate Subcommittee on Public Works and Resources concerning the saline water projects of the Interior Department.

I heard testimony on all of the distillation processes. The most optimistic report indicated that the future may look forward to the distillation of water at the price of approximately 50 cents per thousand gallons. Now at this rate, and this is the future rate, not the present rate, the treatment of the sewage generated in the Washington metropolitan area today would cost $100,000 per day.

I really do not see that we are going to get away from relying on the streams to do a share of pollution abatement, a share that will not pollute the streams, of course. We definitely want to avoid the pollution of the streams to either a public health hazard or even a nuisance condition.

Mr. KEYES. I might make clear that so far as we have been able to determine, that the cities and towns in the upper regions would not need to resort to the distillation process, because there is sufficient

movement of water and sufficient distance and time for proper aeration, and that it is only in the immediate vicinity of the metropolitan area that this would have to occur. We also realize that it is an expensive process, particularly at the moment, but our position is that there is plenty of water in the Potomac for many years to come, and we will have to work gradually toward this millennium when we can have a clean Potomac.

In fact the estimates run something like a 20-year program and $200 million. This is a matter of how strongly the people want a clean river and how willing they are to pay for it. It is a matter of perspective. When you consider that the Baltimore tunnel cost $157 million and it cuts 20 minutes off your travel time through Baltimore, that we should consider a couple of hundred million dollars to clean up the Potomac.

Mr. LEVIN. I certainly agree with that.

Representative HYDE. You have certainly put it in very simple terms, Mr. Keyes, that argue very strongly for it.

Mr. GUTHEIM. Mr. Chairman, I have some statements that I think should be put in the record at this point. One is from the Department of the Interior.

I will not read the entire statement, but three paragraphs from it which I think synopsize it.

Representative HYDE. Thank you very much, Mr. Keyes. You may proceed, Mr. Gutheim.

Mr. GUTHEIM. This is from the Director of the National Park Service:

> I wish to endorse the six objectives which Mr. Frank recommends as a minimum for a sound, long-range program for conservation and recreation as a part of a comprehensive program for the Potomac River Basin.

This is stated, of course, in the committee's publication, Metropolitan Water Problems.

The letter further states:

> We view therefore, with deep concern any proposal to alter substantially the Potomac River below the mouth of the Shenandoah River. The area is so rich in scenic, historic, educational, and other recreation values that only the most critical needs could justify its obliteration by a reservoir.
>
> We do not question the necessity of developing adequate and dependable water supply for the growing Washington metropolitan region and the other cities in the basin. We believe, however, that further study of the basin's water needs, resources, and potentialities can produce plans to meet its needs without obliterating recreational and cultural values of national significance by the construction of reservoirs on the main stem of the river below Harpers Ferry.

(The letter referred to follows:)

DEPARTMENT OF THE INTERIOR,
NATIONAL PARK SERVICE,
Washington, D. C., April 21, 1958.

Hon. ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems,
United States Senate, Washington, D. C.

DEAR SENATOR BIBLE: We wish to submit the following statement in response to your invitation to participate in the public hearings to be held by your committee. We understand that the purpose of the hearings is to provide an opportunity to present factual material that will supplement that contained in the consultant's reports and to permit an expression of views.

The staff report on conservation and recreation in a comprehensive program for the Potomac River Basin with special reference to the National Capital

region prepared for the joint committee presents an excellent overall analysis of the importance of conservation of natural and historic resources for recreation. As Mr. Frank states in this report "the correction of the shortages and imbalance among the land and water areas required for recreation, relaxation, nature education, and spiritual refreshment represents as serious a challenge to the ingenuity and initiative of the basin's people and governments as does the question of how to clean up pollution or meet our future water supply requirements." And I wish to endorse the six objectives Mr. Frank recommends as a minimum for a sound long-range program for conservation and recreation as a part of a comprehensive program for the Potomac River Basin.

We wish to point out that on page 7 of the report where Mr. Frank describes the present status of conservation and recreation, there is no mention of the fact that the present Chesapeake & Ohio Canal property provides some access to the river, nor that there is pending legislation to establish the Chesapeake & Ohio Canal National Historical Park and Parkway although other park proposals are referred to.

Director Wirth's statement on Senate bill 77, to establish the Chesapeake & Ohio Canal National Historical Park and to provide for the administration and maintenance of a parkway, in the State of Maryland and for other purposes, before the Senate Interior and Insular Affairs Committee, June 12, 1957, is applicable here. It reads in part as follows:

"Some 4,760 acres of the C. and O. Canal Property are already in public ownership. The bill would authorize the acquisition of approximately 10,000 additional acres along the Canal and the Potomac River for inclusion in the Park. * * *

"The purpose of the Park would be to preserve the historic structures and values of the Chesapeake and Ohio Canal and bordering lands and the scenic and recreational character of the Canal and Potomac River setting. This should make possible the improvement of access roads, the development of parking areas, campgrounds, picnic areas, boating facilities, the restoration and preservation of the old historic structures and their interpretation to the public, and the rewatering of as much of the Canal as it is practical and economically feasible to accomplish.

"Because of the area's popularity and outstanding potentialities for public recreation, we feel that numerous places along the canal and the river should be utilized for appropriate recreation development, consistent with preservation of the canal's historic and scenic values. * * * Our mission 66 program would provide some seven million dollars for the development of the park and parkway, the restoration of Canal structures, and such other developments as may be required.

"The proposed C. & O. Canal National Historical Park, traversing as it does the route of the Potomac River for 165 miles, presents, in my opinion, the finest possible kind of opportunity to preserve and interpret the story of the early development of this part of the Country, the pushing westward of our frontier across the mountains, its many phases of industrial and transportation progress, the great military engagements that took place in the basin, the peaceful development of villages and early rural life, to mention only a few of the historical phases. It presents also, I firmly believe, the best possible opportunity to preserve an extraordinarily scenic and valuable wild land recreation area close to our great centers of population.

"The proposal should be of substantial economic benefit to the people who reside in or near communities along the general route of the Canal. When the park project becomes a reality it is to be expected that interest will be focused on the area and that visitation to it will materially increase. The additional stimulus that such an influx of visitors would give the economy of Maryland is difficult to calculate, but that it would be very substantial is apparent from the experience of communities in the vicinity of existing parks.

"Some of the historic Canal structures that were in evidence during the Canal-river era are no longer in existence and many others are rapidly deteriorating, as a visit to the old Canal will quickly disclose. The structures that remain are symbolic of an era of progress in our Country's history. As such, they are a part of our national heritage and should be preserved."

The canal and its towpath can become the finest scenic river trail in the United States, giving access to all the related cultural and recreational values that characterize the Potomac River. We view, therefore, with deep concern any proposal to alter substantially the Potomac River below the mouth of the

Shenandoah River. The area is so rich in scenic, historic, educational, and other recreational values that only the most critical needs could justify its obliteration by a reservoir.

We do not question the necessity of developing adequate and dependable water supply for the growing Washington metropolitan region and the other cities in the basin. We believe, however, that further study of the basin's water needs, resources, and potentialities can produce plans to meet its needs without obliterating recrerational and cultural values of national significance by the construction of reservoirs on the main stem of the river below Harpers Ferry.

Incidentally, we would like to point out that the map in the report entitled "Federal and State Recreational Lands in the Potomic River Drainage Basin" does not show Harpers Ferry National Monument. Fort Washington and Prince Edwards Forest are shown as forests; they should be indicated as parks. Also, park lands should be indicated on the Virginia side of the Potomac River extending upstream from Key Bridge to a short distance beyond the Chain Bridge, Virginia Route 123.

Sincerely yours,

E. T. SCOYEN,
Acting Director.

Mr. GUTHEIM. The other statement is by Representative Lankford, who regrets that he cannot be here before the committee, but he asked that this be read in its entirety:

STATEMENT OF REPRESENTATIVE RICHARD LANKFORD

Next to the air we breath, I would say that water is most important to human life. It is also essential to economic and industrial progress, and it is absolutely essential to our national defence Establishment. Pollution is a waste of this precious resource.

Unless we tackle the water pollution problem and tackle it hard and effectively now, we are going to be in very serious trouble in a few short years. Pollution is one of the largest contributors to our present and future water resources problems, and we must recognize that its control is one of the most effective and economical water conservation measures available to us.

In seeking a solution to the Potomac River pollution problem, I would strongly suggest that this joint committee consider this matter on a more far-reaching basis than before. Studies of sewerage disposal and pollution in the metropolitan area heretofore have not gone beyond the 14th Street bridge. It seems to me that if we are to find a permanent means of controlling Potomac River pollution, we must include the lower portion of the river from the 14th Street bridge. In this area we find a very serious problem growing out of the fact that present sewerage treatment above the 14th Street bridge reduces the strength of raw sewerage by only 32 percent. This means it is essential that we find some way to keep this partially treated effluent out of the lower portion of the Potomac River.

Unless some step is taken to free the lower Potomac from pollution, development of that portion of Virginia and Maryland which borders the river is seriously curtailed.

Representative HYDE. Mr. Densmore, may we have your testimony, sir?

Will you state your full name and whom you represent?

STATEMENT OF WALTER C. DENSMORE, ACTING DIRECTOR OF MOUNT VERNON ESTATE

Mr. DENSMORE. I appear before you at the request of the Regents of the Mount Vernon Ladies Association, which owns and maintains the property.

The organization which maintains Mount Vernon has observed the studies concerning pollution of the Potomac River with much interest and with much concern. We have had a good long tenure down there. I personally have been there nearly 24 years, and one of the

most discouraging aspects of our work there has been to see the deterioration of the condition of the water in the Potomac River. We entertain between a million and a million and a quarter people a year for the last 5 years, and there is no sign that we will have many less in the near future.

For at least 10 years we have had to display a sign prominently which warns our visitors to beware of the Potomac River and its state of pollution. It is an embarrassment to us, and those people come to us not only from all over our own country, but from all over this world. We have distinguished guests who go down to George Washington's Tomb on official occasions, and if the wind and the water condition is right, it is an unsavory atmosphere in that area. I do not want to take too much of your time to stress this condition. I do not think I could overemphasize it.

But it is of sufficient concern to us that we heartily endorse Mr. Levin's plan for the Potomac River, but we are much concerned that his plan may not be adequate to take care of our area. It seems to deal specifically with the upper reaches of the Potomac, and we are concerned about what comes into the river at Washington and is caught by the tide between Alexandria and Mount Vernon.

I also might point out that the Memorial Highway is servicing more people for recreation today—I have traveled that road for all of its life—and there is hardly room on weekends and holidays for another person down there.

A certain number of those people inadvertently go into the river, whether it is advisable or not, and it is very discouraging to me to know that they are jeopardizing their health as they do so.

The Mount Vernon Ladies Association has been so conscious of this condition that in 1946 when the State of Virginia established a State Water Control Board, they were one of the first organizations to express their willingness to cooperate to every extent possible to eliminate the disposition of untreated sewage in the Potomac River.

Since that time we have constructed two plants to take care of not only our own facilities but some from the lunchroom down there on the National Capital Parks property, which had no other plant of their own. They have made their own provisions very recently.

I appreciate very much the opportunity of coming here and expressing our concern, and our only desire is that whatever may be done in this rapidly expanding area of the Potomac River below Washington as far as Belmont Bay at least be seriously considered as part of the plan.

Representative HYDE. Mr. Densmore, I think that the report of our consultants on this water problem certainly contemplates more than just necessary improvements in the immediate area adjoining Washington and above, which would be, if carried out, a distinct benefit to you folks.

As a matter of fact, I think except for that portion which does get in below Washington would greatly improve the situation in your area.

However, just how far down this committee could go, as far as the reach of its recommendation is concerned, is questionable. After all, it is the metropolitan area with which we must deal, although of course this committee can make recommendations with respect to the

entire river basin to the extent that what is done in the basin affects the Washington metropolitan area and the District of Columbia. So I am hopeful that whatever good results do come from our studies and efforts and recommendations will result in a distinct benefit to the people in your position.

Mr. DENSMORE. Thank you, sir. I would just like to make one more remark in answer to that.

Our request is that we be considered part of the metropolitan area.

Mount Vernon is being surrounded today by housing developments and, in 5 years if the present trend continues, everything north of Fort Belvoir will be as solid as Arlington County has been for years.

We are close to it and we can see it. The fact that the Government highway owning all of the waterfront south of Alexandria to Mount Vernon borders that section of the river is certainly all the proof that I need that it be considered a part of this plan. That is our concern.

Representative HYDE. Thank you, Mr. Densmore.

Mr. Levin.

Mr. LEVIN. I wonder if you would mind answering a few questions, Mr. Densmore. The report did consider the area as far south as Mount Vernon and indeed beyond, going down to Quantico, and question 4 in the summary of major problems requiring attention states or raises the question:

> How can sewer service be provided to allow and promote the orderly and pollution-free development of the downstream section of the area?

This is certainly in the area.

I learned only after this report was in print, however, about the situation at the Mount Vernon Estate. You have indicated that a million to a million and a quarter people a year visit Mount Vernon. Now this is a large number of people and they require sanitary facilities.

Could you tell us something about the treatment plants down there?

Mr. DENSMORE. Yes, sir.

About 1951 we completed two septic tanks which were designed by a local engineering concern and approved by the State water-control board, because we knew that within a few years our facilities on the place for both men and women would be enlarged and moved.

Treatment plant No. 2 we call it, because we had No. 1 to begin with, which was quite old and inadequate, meet the requirements at the time. As soon as we had installed new facilities and our attendance had considerably increased, we went to the State water-control board again for advice and, once we received the advice, we hired the engineering concern to advise us and design a plant No. 3, which is a complete treatment of the sewage before it is released down through the park to the river.

Mr. LEVIN. Does all the sewage now pass through the complete treatment plant?

Mr. DENSMORE. Every bit of it; yes.

Mr. LEVIN. Do you know what type of plant this is, or is this too detailed?

Mr. DENSMORE. I am afraid I cannot advise you on that.

Mr. LEVIN. You mentioned the National Capital Parks Service. Is it not true that National Capital Parks Service invited the Mount

Vernon Ladies Association to participate with them in a joint sewage-treatment plant in that area?

Mr. DENSMORE. Yes; they did.

Mr. LEVIN. Why was this rejected?

Mr. DENSMORE. Why was it rejected?

Mr. LEVIN. Yes.

Mr. DENSMORE. Because we had our own facilities.

We have been accommodating their concession building down there for a good many years. In other words, we did not need it. They needed it.

Mr. LEVIN. When did they offer this proposal to you?

Mr. DENSMORE. Oh, quite recently. I think their plant has just been installed.

Mr. LEVIN. You feel that your plant is adequate for your present needs?

Mr. DENSMORE. We think our plant is adequate for the present and for the foreseeable future.

Mr. LEVIN. I will have to reconcile this because I have been given to understand that there was a condition of pollution in that area as a result of these plants, the three plants.

Mr. DENSMORE. I beg your pardon?

Mr. LEVIN. I had been given to believe that there was an objectionable condition arising in the Mount Vernon area as a result of discharge of sewage from the Mount Vernon Ladies Association property and the National Capital Parks property.

Mr. DENSMORE. I could make an interesting comment on that. When the State water-control board asked us to make the installation, we had a feeling that the river was worse than what we were putting in it, so we had our discharge tested and we had the river water tested, and we were, to a great degree, correct.

Now I live in Alexandria, very near the river, and I lived at Mount Vernon for 10 years before the war. I have been along the river all my life. At home near Hunting Creek I cannot leave my windows open at night now in the hottest weather of the summer without having a very disagreeable experience. At Mount Vernon, where I spend a lot of my time, at nights, too, it is a little better, but I am further from the river there, and at good elevation, which does make a difference.

Mr. LEVIN. Thank you very much.

Representative HYDE. Thank you very much, Mr. Densmore.

Mr. Soresi.

Mr. Soresi, give your full name.

STATEMENT OF CARL D. SORESI, CHAIRMAN, COMMITTEE FOR A FAIRFAX COUNTY WATER SYSTEM

Mr. SORESI. My name is Carl D. Soresi. I reside in McLean, Va. I have lived in northern Virginia for 15 years.

With regard to the matter at hand, let me say that while I recognize water supply and sewage problems as companion questions, my main interest is in the water-supply field.

During the 1956 water-bond referendum in Fairfax County, I served as chairman of the Citizens Fact-Finding Committee, and last January I formed the Committee for a Fairfax County Water System,

We recently issued two reports on the water problems relating to questions of the Potomac region in general and Fairfax County in particular. I am gratified to learn that these reports proved helpful in preparing your excellent staff studies with respect to Virginia.

In essence, we submitted a proposed program for water service development in Fairfax County emphasizing the need to adopt a comprehensive water service plan to meet present and future consumer demands based on anticipated population growth. The Pickard Population Tables were utilized.

I join with many others in believing that there is no doubt of the inevitability of the regional approach to the problem. However, because of the peculiarly disunited status of water service in Fairfax, we also outlined a program for integrating water supply in the county, looking to the day when we, as a unified county distributor of water, could participate in a broader regional authority plan with something of value to offer.

For the purposes of today's meeting, let me say that while we in Fairfax must face many problems, there are two in the water service field which I believe are properly a matter of immediate Federal concern.

One is the practice of serving water in Fairfax for reasons of profit and power by outside municipalities who enjoy the privilege of buying so-called public water from Dalecarlia for resale.

The other is based on the urgent need for Federal recognition that today's water and sewer service demands in the metropolitan area of the National Capital go far beyond the 100-year-old boundaries of the District of Columbia.

Some background on the first point can serve to explain my ardent belief in the regional approach and the manner in which I believe it is best suited to help sound area development.

During the 80th Congress, Public Law 118 was passed authorizing the sale of Dalecarlia water to Falls Church. That municipality was to obtain water through supply mains owned by Arlington County. The price was established fairly by the District Corps of Engineers.

Today, Falls Church pays 10½ cents per thousand gallons to Arlington County, which in turn pays 10 cents per thousand gallons to Dalecarlia. This favorable cost of 10½ cents, however, is Falls Church's base price above which it currently sells water at a minimum of 40 cents per thousand gallons to consumers in Fairfax County.

So strong is the profit motive that today Falls Church serves some 10,000 consumers within its own city limits and 35,000 consumers in Fairfax County.

Rates are often discriminatory against those Fairfax consumers, and recourse for relief must be sought in a municipality which has no political responsibility to those consumers.

We know that Falls Church has good reason to adopt a water-expansion program not only for profit, but also for the obvious legal case it can make to annex Fairfax County territory. In fact, the latest Falls Church move that deeply worries us in Fairfax is a case to condemn a prime storage site at Tyson's Corner, highest point in Fairfax County from which water supply can flow by gravity to any point in the county—to Chantilly Airport in the north or Fort Belvoir in the south.

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For the moment, therefore, there is an uneven race between Falls Church and Fairfax as to who shall serve water in the county itself.

But the point is this: Falls Church has developed a great advantage because of the loosely defined Public Law 118 and the absence of restrictions on profit from the sale of public water. You must help us to stop the present usurpation by Falls Church of our county's water service potential.

Amendment of Public Law 118 is urgently needed, and, I believe, will go a long way toward helping Fairfax County get its house in order and forge a water-service program to prepare itself for making a real contribution to the regional authority principle.

There is an important fact to be reckoned with in all this by those who propose a regional authority solution, and it is this:

If Fairfax or any other municipality is to develop as the local government can best see it, it should have, among other things, prime control over its water distribution system.

In order to attract, for example, desirable industry, the local government should have the flexibility to be able to serve that industry.

In my county's case, Fairfax would have many beneficial motives to attract that industry and would weight them all in the balance. But if Falls Church were to consider the matter, the prime consideration would be simply profit.

On that basis alone, our county might lose that beneficial industry through inability to cooperate.

What we need to know in considering the generally desirable regional approach, therefore, is the extent to which the jurisdictions could maintain flexible distribution control within the responsibility framework of an eventual regional authority.

We want to be able to plan the development of our own residential, commercial, and industrial communities. In this, the future guidance and development of our sewer and water service is a prime essential.

If a superauthority means local control so complete as to include jurisdictional distribution of sewer and water service, then there is much reason to doubt its immediate feasibility.

But if a superauthority means a cooperative venture—low interest or matching funds financing for capital improvements and modernization, plus tie-in controls on pollution and water availability in which a common stake is created to safeguard the Potomac—then the Federal Government will have made a long good start toward the metro plan.

In essence, I personally feel that control for the sake of control will meet stiff resistance in northern Virginia. But a format for cooperative financing, planning, and control will be welcomed. The key to it, as things stand now, is an enlightened program of Federal financing and planning.

Regarding the point of Federal responsibility extending beyond the District boundaries, I ask this committee to regard water and sewer sewer service programs in the same light as such Federal help programs as hospital construction aid or school building projects and aid to local education.

Participating municipalities to, let us say, a Northern Virginia Regional Sanitation Authority, will need the encouragement of Fed-

eral financial aid. Local taxes we know can't do the full job that today needs to be done. The local municipalities, if they are to cooperate in any worthy sense with a Federal authority, need a Federal line of credit for their capital improvements.

Public Law 533 of the 81st Congress authorizes United States Treasury loans for expansion and improvement of the District of Columbia sanitation system. My belief is, that if full cooperation is desired for an ultimately beneficial result, such favorable financing measures and lines of credit for water and sewer projects will have to be extended to the local municipalities forming the greater metropolitan region.

It is in this direction, I believe, that there is real hope for creating a Northern Virginia Sanitation Authority which can participate with the District and Maryland authorities toward the goal of common interest in the Potomac Basin as outlined in the current staff reports.

Representative HYDE. Thank you, Mr. Soresi. I may have missed it, but I still don't know whom you represent.

Mr. SORESI. Sir, I am the chairman of the Committee for a Fairfax County Water System.

Representative HYDE. I see. Now, you apparently disagree with the representatives from the Washington Suburban Sanitary Commission who, as I got it, didn't see much need for a change in the present financial and regulatory setup for handling this problem in the area.

Mr. SORESI. I don't know exactly what their point was, but I was here when the chairman of our Fairfax Board of Supervisors, Mrs. Wilkins, spoke yesterday and urged that Federal financing be provided to take care of our sewer and water programs, particularly sewer programs.

If that is in disagreement with the Washington Suburban Sanitary Commission, my position is the same as Mrs. Wilkins.

We need the money if we are going to be able to cooperate with the eventual hope and goal of a regional authority.

Representative HYDE. If it is in disagreement, so be it.

Mr. SORESI. If it is in disagreement, so be it, sir; yes. They have a difficult situation, I think. We are a highly diversified area in northern Virginia in terms of water supply.

In Fairfax County alone we have got, I think it is, at present 12 private water companies and 4 municipal water companies serving in the county.

There is no question there is a lot of difference, and we need your help not only in the Public Law 118, which is hurting us in the county.

It is manifestly unfair to virtually subsidize a municipality like Falls Church to extend and continue to extend and to condemn land in our county, when we are so anxious to put over a program that will coordinate all of the systems in Fairfax County for the general good.

And being in that position, being able to cooperate with a larger authority if and when it comes up, and I hope soon it does come up.

Representative HYDE. Your expression of a desire to coordinate the work in this field in northern Virginia, you speak for your com-

mittee? Do you think you speak for your local officials, too, in Fairfax County?

Mr. SORESI. I officially cannot speak for my local officials, but I think it is a matter of record that our local officials have been on record for a long time as favoring a unified water system in Fairfax County.

Representative HYDE. In Fairfax County?

Mr. SORESI. Yes, sir.

Representative HYDE. Would you say that would extend to all of the northern Virginia area, let us say, within the metropolitan area?

Mr. SORESI. Oh, I don't know, sir. You mean about the possibilty of a Northern Virginia Regional Authority? I know that there is now a move for Fairfax County and the city of Alexandria to get together. I think there is an officially approved committee that is working on a coordinated purchase plan of the Alexandria Water Co., and in that it suggests it move toward a regional authority. I would say that that is correct.

Representative HYDE. Has your committee considered the matter of regional regulations of pollution in the Potomac Basin?

Mr. SORESI. No, sir; we have not.

Representative HYDE. You have not considered that?

Mr. SORESI. No. We have not, because we were interested in the particular program of availability of water from the Potamac River and the unification of the systems in Fairfax County.

Let me say that we have considered it only in this sense: that we recognize the Potomac River as the prime source of water. We recognize that there should be planning ahead and in the future in advance of consumer demand based on population growth, and would certainly support any measures to increase the amount of raw water and to safeguard the amount of purity of that water so as to cut down the cost of filtration, for its use as we would want to make of it, and the rest of the area.

Representative HYDE. Has your committee considered the suggestions made in the reports of the consultants of this committee regarding dams on the river about which we have had some testimony?

Mr. SORESI. No, sir; we have not. I can only speak personally about that. In 1956 when Colonel Adams was here on the District Corps of Engineers, the Citizens Fact-Finding Committee was very much interested in his program.

Based on the studies that I have lived with and made, it seems to me that the water storage bank above Great Falls, while it may hurt some people in terms of their property, for the general good is obviously going to have to be the answer in the years ahead.

Representative HYDE. You are speaking personally, now?

Mr. SORESI. I am, sir, and perhaps I shouldn't even say that. It is only a personal feeling.

Representative HYDE. Thank you, Mr. Soresi.

Mr. Gutheim.

Mr. GUTHEIM. Mr. Soresi, yesterday we heard Mr. Robinson of the Northern Virginia Regional Planning and Economic Development Commission.

Mr. SORESI. He is the executive director; yes.

Mr. GUTHEIM. Who read a statement from the chairman of that commission describing their intention to give further study to this matter of an integrated water system for northern Virginia. Would your committee be able to participate in that study that Mr. Robinson and Mr. Moss described?

Mr. SORESI. Not only would we be very happy to participate in it, but I understand from the chairman of the commission that he has talked informally with a few of the members of our committee, and that we will be represented in the Northern Virginia Regional Planning Commission's study if and when the various participating jurisdictions will agree to that as a project.

Mr. GUTHEIM. I gathered from your statement that your committee had limited itself entirely to water supply questions, and that you had not considered and have no views on an integrated sewage disposal system.

Mr. SORESI. No; the interest is only implicit. Obviously if we are going to consider the Potomac River as a prime source of water supply, we ipso facto are interested in maintaining the Potomac as such and pollution would certainly kill it.

But we have not made a study on sewer; no.

Mr. GUTHEIM. I realize that there has been relatively little time for bodies like your own to give as detailed consideration as you might perhaps wish to the reports that our consultants have prepared, and I would like to emphasize that ours is a continuing committee, that these hearings are primarily exploratory, and that as we go along, we would hope that if you have further views, you will let us know.

Mr. SORESI. I might say, sir, that we certainly appreciate, I am sure everyone on the committee would appreciate, such sentiments, because in the long run, if we are going to participate, you are going to need public support.

And if we can work toward a common goal of public support in this thing, it will help to get over many of the difficult hurdles ahead that are technical and legal.

Representative HYDE. Right along that line, Mr. Soresi, the committee would appreciate very much your consideration of the specific questions raised on pages 24 and 25 of the report, and give us to the extent that you feel you are able, your views on the questions raised there.

Mr. SORESI. I will be happy to submit that, sir. Is there an opportunity to turn that in to you later for the record?

Representative HYDE. Yes; the record will be kept open for that purpose.

Mr. SORESI. I will be glad to.

Representative HYDE. Mr. Levin.

Mr. LEVIN. I would just like to call attention to the display here which is figure 3 from the water supply report. The hatched areas represent the 16 different water supply systems in Fairfax County.

We heard from a Washington Suburban Sanitary District that the 515,000 people in the WSSD area, 95 percent of them are served with water through the Commission. The Corps of Engineers estimate—no, it was not the Corps of Engineers, I believe it was your committee, Mr. Soresi, and correct me if I am wrong, developed figures which indicated as recently as a year ago that despite the fact that there were

16 systems in a much smaller area, only 46 percent of the population in that area was served by the system.

Mr. SORESI. That is correct. That is the best available data we have got. Fairfax County is a rapidly growing county. The major portion of it is still rural, and so the service is still by individual wells.

In certain counties, such as Herndon and Vienna and the county of Fairfax, those municipalities have systems which have wells as water supply, so that city water, as we know it, is only about 46 percent.

Mr. LEVIN. This is despite the fact that, as the assistant director of the Suburban Sanitary Commission said this morning, topography in Maryland requires a number of pressure zones to provide service, whereas you have indicated that the strategic location of Tyson's Corner would allow service by gravity to the entire area.

Mr. SORESI. There isn't any question about it. That underscores our concern about what Falls Church has ordered its attorney to do, condemning Tyson's Corner. He who gets the first storage tank at Tyson's Corner, and can fill that tank with water, controls the county's water potential, and they are being subsidized to do it, because of Public Law 118.

Representative HYDE. Maybe we ought to get some of those boys from out West.

Mr. SORESI. We ought to do something, Mr. Chairman. All we can do is appeal to you.

Representative HYDE. Have them stage a little feud, on water rights.

Mr. SORESI. We want to get over the feud. Believe me, we have got to cooperate if we are going to get a long-range plan approved, but it is hard to do it when you have got a competition that is virtually subsidized by a loosely written law.

Representative HYDE. Thank you very much, Mr. Soresi.

(Mr. Soresi subsequently submitted the following material to be included in the record:)

REPLIES TO QUESTIONS ON MAJOR PROBLEMS REQUIRING ATTENTION

Staff report on water supply, Joint Committee on Washington Metropolitan Problems

I. What type of storage facilities should be provided on the Potomac River?

Storage facilities should, ideally, serve the following purposes:

Adequate water supply—present and future needs.
Pollution abatement and silt control.
Flood control.
Recreation.
Incidental hydroelectric power.

Selection of location of storage facilities should be based on sound engineering, economic, and area-community factors. In essence, the procedures toward this goal as now employed throughout the Nation by the Corps of Engineers is a good starting point, particularly as delineated in the corps plan of survey on file with the joint committee.

II. Should the water-supply systems in the Washington metropolitan area be consolidated, either administratively or physically or both?

The water-supply systems of the Washington metropolitan area should be administratively consolidated for the following purposes:

The present and future dependence of the entire area on the Potomac River for water supply will eventually require a metropolitan regional agency to safeguard and to determine allocation to the several jurisdictions of the prime

source of water supply, and to fix wholesale water charges. The responsibilities of such an agency must be legally defined by interstate compact with congressional approval. Such an arrangement could recognize and serve existing distribution agencies in Maryland and the District of Columbia. To fully utilize this beneficial arrangement, a similar water-supply entity in Virginia would have to be created in the form of a northern Virginia regional authority.

Elements of physical consolidation now exist, and should be continued and expanded. But the right of determination for expansion and distribution within the jurisdictions themselves should be sustained and preserved.

III. What steps can be taken to assure that future decisions affecting water supply can be made in a spirit of cooperative area planning rather than community competition?

The major step to be taken to promote area cooperation is removal of the profit motive—both financial and territorial—in operation of municipal distribution systems. Provision should be made for Federal-aid financing of capital outlays which will not place undue burden on existing area consumers. Rapid growth of any area is the principal factor requiring large capital expenditures for system expansion in advance of demand. Since the growth in the Washington metropolitan area is largely the result of Federal Government, the participation by Federal Government in long-term financing is considered to be eminently appropriate.

IV. How can the Potomac River upstream from Washington be protected against future pollution from residential, commercial, and industrial development?

1. The practice of adequate zoning should be applied vigorously to guide development in an orderly manner, so that sewage collection, treatment, and outfall facilities may be constructed economically and concomitant with a general plan.

2. A comprehensive area plan for sewage collection and disposal should be prepared immediately, supported by Federal-aid financing for the general benefit of the federally impacted area as a whole.

V. For what period into the future should plans and construction be undertaken?

This question can have no categorical answer. In areas having slow rates of growth, plans for and construction of utilities can provide for economical units of expansion commensurate with their rates of obsolescence from use alone. In the National Capital area, where abnormal rates of growth are evident, the longest feasible look into the future is essential.

In this connection, Brig. Gen. Thomas A. Lane, former Engineer Commissioner of the District of Columbia, stated as follows on the occasion of hearings conducted by the Corps of Engineers on the Potomac River basin in June 1957:

"I am concerned because I recognize that the normal short-range periods upon which all of our planning information is forecast do not furnish an adequate basis for evaluating this (water-supply) project. We have population forecasts to 1980, and an occasional reference is made to the year 2000. No estimates are available for the year 2057 or later, yet these are the terms in which we should be thinking upon so basic a project.

"We face today the urbanization of the entire east coast, from Boston, Mass., to Washington, D. C. There is no reason to forecast any early termination of this trend. The implications are that the metropolitan area of the Nation's Capital will, in the next century, expand far beyond anything which present planners can foresee."

VI. What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

As to area cooperation, the situation in Maryland is under control of the Washington Suburban Sanitary Commission, which exercises planning and operations over a wide area. The District of Columbia is served by the Corps of Engineers, which cooperates with the District government on a satisfactory basis.

A regional water-service organization in Virginia is nonexistent, and cooperation between major jurisdictions exists only on a basis of developed exigencies. This is not to say that arrangements for cooperation in some fields have not developed, such as between Maryland and the District on sewage treatment and between Arlington County and the District for water supply.

The minimum basic pattern for area planning for the immediate future would seem to require a preservation of existing major working agencies in Maryland

and the District of Columbia and the establishment of an equivalent body in northern Virginia, bound together with an administrative agency supported by compact to preserve the Potomac River as the general area's prime water-supply source.

The two State and District of Columbia agencies would plan, build, and operate in their own jurisdictions in accordance with an areawide plan supported by the metropolitan regional agency. This metropolitan agency would, in turn, prepare budgets for congressional funding of appropriate major capital outlays, with repayment funded on a long-term basis from system revenues.

PUBLIC REPORT ON A PROPOSED WATER SYSTEM FOR FAIRFAX COUNTY, VA.

ISSUED MARCH 3, 1958, BY THE COMMITTEE FOR A FAIRFAX COUNTY WATER SYSTEM, McLEAN, VA.

Water is the community's sacred treasure for all its people. The good fortune of Fairfax County—its ability to plan for a water system from a permanent water source at its shoreline—is underscored by the following evaluation of what lack of water means to the Southwest:

"* * * It (the drought) comes slowly, so that the damage of each day is slight when compared to that of the day before. There is nothing exciting about it, no sudden death, no quick need for dramatic services of the Red Cross, martial law, or the State police. The drought administers an all but imperceptible torture—a torture constantly attended by hope. It is a slow fire burning everything without smoke or flame, a consuming fire which man has not yet learned to quench.

"It leaves in its wake ruined homes, destroyed crops, reeling cattle, dead forests, and blasted fortunes. When it departs, it leaves no heroes, for no man has anything to do with its coming or its going. In other disasters, some are lucky and some unlucky, some live and others die. But in the drought, nobody is lucky for nobody escapes; everybody loses—the merchant, the banker, the farmer, the rancher. It is the most impartial disaster that society endures from natural causes."—Walter Prescott Webb, Harper's magazine, December 1953.

INTRODUCTION

The following report is based upon the premise that the recently created Fairfax County Water Authority is interested in suggestions relative to obtaining adequate water service for the county, and that two basic objectives are imperative:

1. For the future of its economy, Fairfax County must establish an integrated water system which will presently serve and henceforth attract well-planned residential, commercial, and industrial development.

2. The county must either act now and promptly in this establishment, or else run the risk that pending water service programs by noncounty interests will render future action economically prohibitive.

The undersigned committee submits this report in the belief that Fairfax County has not only a responsibility but a prime right to serve its own present and future consumers.

It recognizes the existence of various water systems now diversely serving the county, and takes special note of two forward looking and dynamic water service programs currently proposed by two related municipalities—the city of Falls Church and the town of Fairfax.

The committee believes that water service into the county beyond the corporate limits of Falls Church and the town of Fairfax is today being expanded primarily as a major source of revenue for those two municipalities. In contrast, the principal need for a water system owned and operated by Fairfax County is not profit, but a critical necessity for safeguarding the county's economic future—indeed, its very existence as a political entity.

These, among other factors, underscore that view:

1. Delay in establishing a countywide water system will undermine the county's chances of attracting desirable commercial and industrial development, which in turn will affect the tax base and the individual tax burden.

2. If the municipalities, not Fairfax County, ultimately control expanded water service into the county, then water service standards, rates, and development

will be directed from offices outside county jurisdiction. Thus, the necessary right to plan directly with Fairfax residential developers, or with future industries seeking location in Fairfax County, will be in the hands of others who would not consider the future welfare of the county as their primary interest.

3. The municipalities will use mounting profits, earned from water service charges to Fairfax consumers, to further expand their areas of public utility service into Fairfax, thereby creating new bases for more and more annexation suits against the county in the years ahead.

Obviously, the situation makes rapid development of a Fairfax County water system a matter of urgent and vital importance. In perspective, the committee believes that time is running out when the county can still plan feasibly for an integrated water system and that its future possibilities are now in serious jeopardy.

In submitting this report, the committee as a whole makes no claim to technical engineering competence, nor does it recommend its proposed water system plan as anything but a suggestion and a guide to the county water authority, and as a useful frame of reference to the county board and taxpayers at large.

Cost figures and other information herein are based primarily on estimates given to this committee by officials of Arlington County, the District Corps of Engineers, Massey Engineers of Fairfax, Patton & Kelly Associates and Holland Engineering Co. of Alexandria.

Acknowledgements are also gratefully tendered for useful information given to the committee by officials of the city of Falls Church, the town of Fairfax, the Annandale Water Co. and the Alexandria Water Co.

This report could not have been printed without some contributions from a group of Fairfax County residents, to whom the committee is deeply grateful.

Signed:

Carl D. Soresi, executive editor, World Press; chairman, Citizens Fact-finding Committee; member, Fairfax Hospital Board of Trustees; member, Airport Study Committee, Northern Virginia Regional Planning and Economic Development Commission.

Richard C. Bain, political scientist, Brookings Institution; chairman, regional plan study committee, Northern Virgina Regional Planning and Economic Development Commission; member, Fairfax County Growth Committee.

Bun B. Bray, Jr., manpower specialist, Federal Government; past president, Fairfax County Federation of Civic Associations; past president, Columbia Pines Citizens Association.

Charles M. Platt, financial writer; vice chairman, Regional Fiscal Survey Group, Northern Virginia Regional Planning and Economic Development Commission.

D. V. C. Birrell, hydraulics engineer, Federal Government; engineering member, Fairfax County Drainage Committee; past president, Lake Barcroft Community Association.

I. Chronology and Background

On September 4, 1957, the Fairfax County Board of Supervisors voted unanimously in favor of creating a county water authority with two basic objectives publicly defined:

1. Purchase of the Annandale Water Co., representing the key company in the eventual formation of a countywide integrated water system.

2. Development of a permanent water source for Fairfax County, presumably at the Potomac River.

On September 18, 1957, the county supervisors appointed a five-man group to the authority with instructions to attain the above named goals as soon as possible.

Falls Church

Facing the new water authority was an October 20 "sale deadline" of the Annandale Water Co. set by owner James McWhorter. Coincidentally, the city of Falls Church had announced its intention to purchase the Annandale Water Co., giving rise to the urgency for Fairfax to be prepared to submit a bid.

On October 16, 1957, public announcement was made that the "sale deadline" had been advanced to November 20, 1957, by common consent of the Fairfax Water Authority, Mr. McWhorter and the city of Falls Church, so as to give Falls Church engineers an opportunity to study and evaluate the Annandale Water Co.

On November 13, 1957, public announcement was made that the Fairfax Water Authority and the city of Falls Church had "reached an accord on a joint study aimed at purchase of the Annandale Water Co."

A joint statement issued by both groups specified that the decision was binding upon neither group. But it made clear that the study "was aimed at a possible joint purchase of the strategically located facility."

The council of the city of Falls Church said it had authorized its consulting engineering firm, Wiley & Wilson, to spend up to $2,000 on the study. The joint statement issued by the council and the authority said they had agreed "to joint together in a further engineering study of the Annandale Water Co. system to determine a method of purchase of the system which would be beneficial to both the city of Falls Church and Fairfax County" (Star, January 13, 1957).

Amid these announcements were warnings from various members of the Fairfax County Board stating that Falls Church's frequently announced aggrandizement plans for further water service into areas of Fairfax County would be considered as preempting the county's right to serve its own consumers. As a corollary, the Fairfax Board of Supervisors on January 29, 1958, voted unanimously to invite the water authority to submit a progress report on its work since the authority's formation.

Background

Concern by several Fairfax County officials and taxpayers has been expressed at various times over the aggrandizement plans announced by the city of Falls Church. On the record, the city has followed a pattern of announcing its major plans for service in Fairfax, and then denying them when these plans were contested publicly. But one fundamental indication on the record is revealing:

In the late fall of 1957, while Falls Church officials were negotiating with the authority and vigorously disclaiming aggrandizement plans to serve greater areas of Fairfax County, principals of a White House engineering survey on the supplementary airport conducted by Presidential aid Gen. Elwood Quesada, were advised by Falls Church that it would be prepared to serve water to Chantilly Airport.

This information is reported on page 27 of the now public White House report on Chantilly Airport, where it identifies water supply sources for the proposed airline terminal as follows:

"Town of Falls Church at Tyson's Corner which is connected to the Washington District Corps of Engineers Dalecarlia Filter Plant. Although present facilities can supply only the initial airport demands, the town of Falls Church's program of expansion will make available sufficient capacity by 1962 to meet the future needs of the airport."

By way of further confirmation, the city of Falls Church has recently completed construction of a costly 36-inch water main in the Potomac River Dam above Chain Bridge for certain future utility. The extent to which Falls Church has so far enlarged its service areas can be measured by the fact that it now serves not only its 10,000 population, but also serves some 35,000 people in Fairfax County. The operation is quite profitable. Noteworthy is the fact that Falls Church pays 10½ cents per thousand gallons to Arlington County, which in turn pays 10 cents per thousand gallons to Dalecarlia. This favorable cost of 10½ cents, however, is Falls Church's base price above which it currently sells water at a minimum of 40 cents per thousand gallons to consumers in Fairfax County.

Falls Church's practice of profitmaking from the sale of Dalecarlia public water to Fairfax consumers appears to be in contradiction to the legislative intent of Congress concerning operation of the District of Columbia water supply system. The basic philosophy which motivated the legislation permitting the sale of public water outside the District of Columbia was to provide—on a nonprofit basis—for the water supply needs of Federal employees residing in areas adjacent to the District. Basic legislation for the sale of water to all customers generally provides that all receipts from sale of water must be used exclusively in support of the water system. Also under the law, Dalecarlia water cannot be sold to privately owned water companies, only to municipalities. Falls Church's practice of selling this public water at a profit, however, has never been legally contested.

In any case, and from all evidence at hand, it appears obvious that despite periodic denials, Falls Church's dynamic, aggressive, and profitable program of expansion envisions greater inroads into Fairfax County service territory, principally in the northern and westerly directions of the county. There is no sign that it would voluntarily curtail the expansion of its profitable operation in Fairfax County.

TOWN OF FAIRFAX

The town of Fairfax has advanced a major plan for water supply of far-reaching significance to Fairfax County.

Utilizing the watershed of Goose Creek in Loudoun County, the town of Fairfax now plans to develop a supply of 3½ million gallons per day. Much difficult negotiation and litigation has characterized the progress of such plans to their present status.

On December 10, 1956, after long litigation with the Loudoun County Board, town of Fairfax officials obtained a court approval to build a 24-foot-high, 700-foot-long dam at Goose Creek to impound some 300 million gallons, covering 80 acres. A public referendum to spend $4,500,000 for this development had been approved on April 10, 1956, by town of Fairfax residents.

On January 28, 1958, following legal appeal brought against the town by the Loudoun County Board, the Virginia Supreme Court awarded the town of Fairfax the right to proceed on the basis of the original court approval.

Background

While the prime purpose of that development is to supply water to the expanding town of Fairfax, its effect upon Fairfax County's future water service program on an overall plan is unquestionably serious.

This committee has been given to understand that the route of the main supply trunk from the Goose Creek Dam would generally follow the existing "Old Dominion Railroad." This route goes past the Chantilly Airport site through the town of Herndon, and flanks Sunset Hills, proposed site for a "small city" development around the Virginia University site.

As this report subsequently shows, service to future developments in the areas of Chantilly, Herndon, and Sunset Hills is vital to the fulfillment of a full-scale water-supply program under Fairfax County control. (Outline in stage II attached folio.)

CONCLUSION

In the light of the expansion programs of the city of Falls Church and the town of Fairfax, it becomes clear that Fairfax County must proceed at once if its aspirations for a long-range integrated water system are to be fully realized.

The initiative and economic feasibility for launching a Fairfax County water system on a major scale is still at hand. But loss to Falls Church and the town of Fairfax of such strategic service areas and storage sites as are herein described will jeopardize the county's hopes for an economically feasible integrated system in the years ahead.

Equally, the opportunity to attract desirable industry and other development for related county tax relief will be materially hampered if the county has no voice in the rate or direction of water-supply expansion.

It is reasonable to expect that few industries will presently be interested in Fairfax County as a location if its government cannot, by itself, guarantee prime utilities such as a sure and ample water supply.

II. The Problem

Fairfax County's rapid and continuing population growth—plus the economic need for attracting desirable industry—accentuates the urgency of the moment in developing a countywide water system. Of the 15 water systems now serving the county, 4 are municipally owned and operated and 11 are privately owned and operated, to serve population as follows:

	Population served
Municipal:	
City of Falls Church (outside corporate limits)	35,000
Town of Fairfax	7,500
Town of Herndon	1,900
Town of Vienna	7,500
Private:	
Alexandria Water Co	42,636
Annandale Water Co	15,750
Boulevard Estates	25
Fairfax Hydraulics Water Co	14,200
Pimmit Service Corp	5,500
Sydnor Well & Pump Co	2,260
Tauxemont Community Association	400
Tremont Water Co	490
Wilton Woods Water Co	200
Woodlawn Water Co	4,800
Total	138,161

Discrepancies in standards of service to consumers are legion, becoming particularly evident in summer periods of drought.

Separately controlled sources of supply (either from wells or river) plus insufficient pipe main sizes and inadequate storage facilities maintained by the individual water companies, have been described as the root of water problems for the individual consumer in Fairfax. In addition, wide divergence in rates, plus inadequate consumer-to-company relations, has made those problems acutely felt.

In contrast, this committee believes, a unified water system under county authority control will be far more practical and conducive to the promotion of well-planned development in Fairfax County—specifically as a corollary to current plans for action on countywide residential, commercial, and industrial programs.

The problem, therefore, is to get started:

To put Fairfax County in the water business on a sound, equitable and businesslike basis,

To take immediate steps for insuring prompt control of key systems now in service, primarily Annandale Water Co.,

To develop the basic supply lines and storage sites for a future countywide service,

To launch plans for the goal of a permanent water source, presumably the Potomac River.

This committee feels that vigorous prosecution of these objectives should be undertaken simultaneously and promptly in the following indicated stages.

III. A Proposed Program

Any water service plan worthy of serious consideration should be flexible in design and long range in scope, so as to meet population growth demands as they arise.

This proposal is submitted as a general outline, resulting from considerable study and numerous discussions with competent authorities. It is submitted as a basis for public discussion and for further analysis by qualified engineers.

Immediate step

It is first proposed that the Fairfax County Water Authority take immediate steps to acquire, by condemnation if possible, the Annandale Water Co. and its additional properties—the first crucial link in a long-range system.

In the light of the dynamic expansion programs of Falls Church which can clearly jeopardize the development of a countywide system, it is further suggested that the Annandale water system then be furnished water—either from the Alexandria Water Co. or the city of Falls Church—as a holding operation. Purchase of such water, however, should be on a temporary basis only, at the cheapest rate possible, and without relinquishment of any existing or potential water service area in the county to whoever supplies that water.

It has long been understood that the Annandale Water Co. may require improvement and strengthening of distribution lines to insure adequate water service, primarily in terms of storage and service pressure. Cost for this is included in the attached folio.

A study of the attached map indicates why this committee also suggests the purchase at an early date of the Pimmit Service Co. and Tremont Gardens Water Service Co.

STAGE I

The creation of the main artery supply line toward a future countywide service is proposed as follows:

1. Negotiate for purchase of temporary water from Arlington County at its Chain Bridge tap or from Falls Church's 36-inch main for joint city and county use, or from any other local source—whichever may prove most feasible.

2. Install a supply line from that source to Tyson's Corner, running up Route 123, along the CIA site, through McLean and Lewinsville to Tyson's Corner. A pumping station would be required at Lewinsville to utilize an initial 2 million gallons per day storage tank at Tyson's Corner—the highest point in the county.

Such a development would insure initial water supply and storage at Tyson's Corner, elevation 600 feet, from which point water service can be supplied to any area in the county by gravity flow. It would create a strategically located water supply sufficient to meet the needs of 75,000 people at an average annual flow of 6 million gallons per day.

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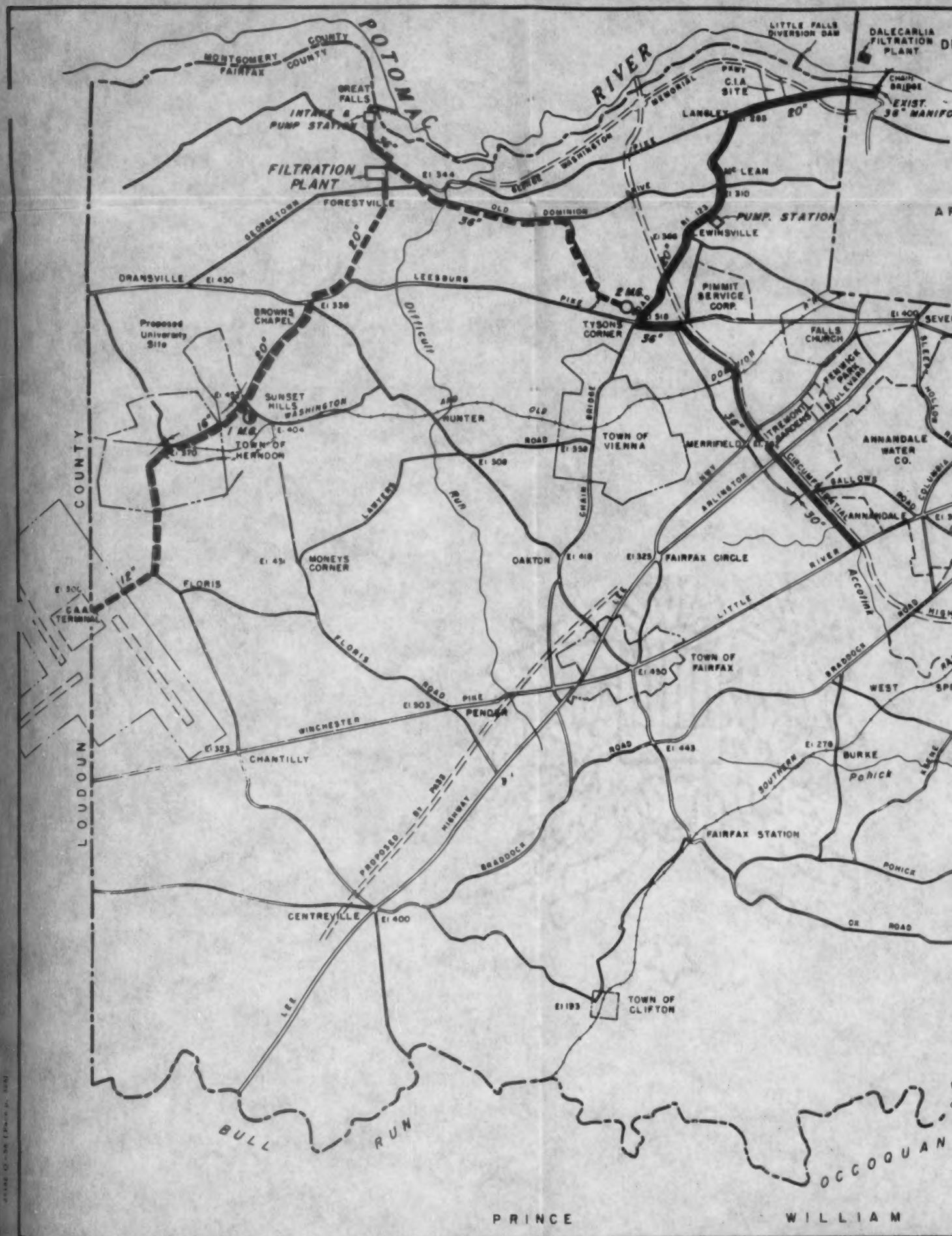
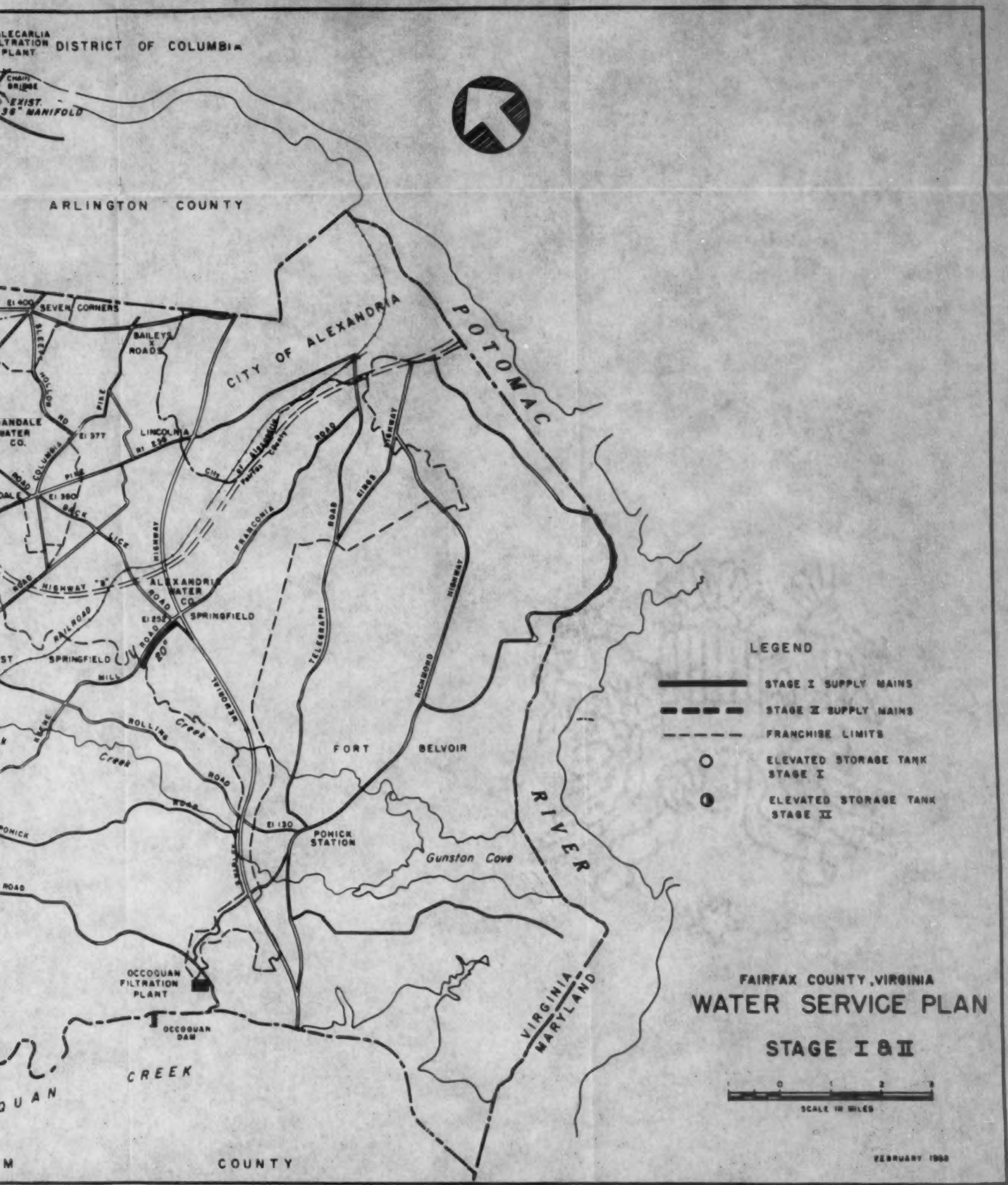

POTOMAC RIVER
MONTGOMERY COUNTY
FAIRFAX COUNTY
GREAT FALLS
INTAKE & PUMP STATION
FILTRATION PLANT
LITTLE FALLS DIVERSION DAM
DALECARLIA FILTRATION PLANT
C.I.A. SITE
CHAIN BRIDGE
EXIST. 36" MANIFO
LANGLEY
MacLEAN
PUMP. STATION
LEWINSVILLE
FORESTVILLE
GEORGETOWN PIKE
OLD DOMINION DRIVE
DRANSVILLE
LEESBURG PIKE
PIMMIT SERVICE CORP.
TYSONS CORNER
FALLS CHURCH
Proposed University Site
BROWNS CHAPEL
SUNSET HILLS
WASHINGTON
HUNTER MILL ROAD
TOWN OF HERNDON
TOWN OF VIENNA
MERRIFIELD
FENWICK PARK BOULEVARD
ANNANDALE WATER CO.
DIFFICULT RUN
CHAIN BRIDGE
ARLINGTON BLVD.
CIRCUMFERENTIAL HIGHWAY
GALLOWS ROAD
LOUDOUN COUNTY
LEE HIGHWAY
MONEYS CORNER
OAKTON
FAIRFAX CIRCLE
ACCOTINK
DULLES INTERNATIONAL AIRPORT
FLORIS
FLORIS ROAD
TOWN OF FAIRFAX
LITTLE RIVER TURNPIKE
BRADDOCK ROAD
WEST SPRINGFIELD
WINCHESTER PIKE
PENDER
CHANTILLY
SOUTHERN RAILWAY
BURKE
POHICK
PROPOSED RT. 7100 HIGHWAY
FAIRFAX STATION
CENTREVILLE
TOWN OF CLIFTON
BULL RUN
OCCOQUAN
PRINCE WILLIAM


DISTRICT OF COLUMBIA
ARLINGTON COUNTY
CITY OF ALEXANDRIA
POTOMAC
SEVEN CORNERS
BAILEYS X ROADS
LINCOLNIA
SPRINGFIELD
ALEXANDRIA WATER CO.
FORT BELVOIR
POHICK STATION
Gunston Cove
RIVER
OCCOQUAN FILTRATION PLANT
OCCOQUAN DAM
CREEK
VIRGINIA
MARYLAND
COUNTY
LEGEND
STAGE I SUPPLY MAINS
STAGE II SUPPLY MAINS
FRANCHISE LIMITS
ELEVATED STORAGE TANK STAGE I
ELEVATED STORAGE TANK STAGE II
FAIRFAX COUNTY, VIRGINIA
WATER SERVICE PLAN
STAGE I & II
SCALE IN MILES
FEBRUARY 1960

LEGEND
FAIRFAX COUNTY, VIRGINIA
WATER SERVICE PLAN
STAGE I & II

3. Installation of a 36-inch main from Tyson's Corner, paralleling Circumferential Highway B to the intersection of Gallows and Woodburn Roads, just below the Fairfax Hospital site, at the northwest tip of the Annandale water service area.

This main trunk would continue from that point with a 30-inch supply main, continuing to parallel Circumferential Highway B to Route 236.

The attached map indicates the general service area which the aforesaid supply main development can easily and most practically serve:

From Tyson's Corner, north of Vienna along Circumferential Highway B, east of Madrillon, west of Pimmit Hills through Dunn Loring, Merrifield and the Chiles Tract, east of the Fairfax Hospital site; thence continuing southward east of Pine Ridge, Popular Hills, Mill Creek Park, Wakefield to Fairfax Hills—all flanking the Annandale Water Co. service area and including the systems of Pimmit Service Corp., Tremont Gardens and Fenwick Park.

Potential

The heart of a countywide system, with major and permanent storage facilities and a supply trunk down the middle of the county, would now be established.

As shown on the water service plan stage I folio, construction time for completion of stage I is aprpoximately 15 months, at an estimated cost of $7 million. It would create immediate potential service to an area containing 42,500 population within the close proximity of this stage I main artery line.

Beyond the immediate value of this development, however, is the fact that Fairfax County would at last be in a tangible position to advance toward the fulfillment of a definite and incontestible countywide water service of virtually unlimited proportions.

Engineering, construction, cost factors and other details learned by this committee have been summarized in the attached folio showing the comprehensive water service plan.

While the members of this committee are obviously not, by background, in a position to delineate technical financial schedules of repayment for this expenditure, it has nevertheless been assured by authoritative sources that this problematical but crucial stage I of development can be made on an economically feasible basis.

For purposes of direction, however, the stage I development creates a significant emergency tie to Dalecarlia, initially insuring the vital water-storage site at Tyson's Corner, key storage site in Fairfax County, and creates the first major and permanent supply trunk down the middle of the county.

STAGE II

Based upon growing demand, the county would now be in a solid position to advance toward the long-cherished reality of a permanent water source tap directly from the Potomac River (based on assurances for Fairfax County obtained from the State of Maryland on March 27, 1957) as follows:

1. Construction of a raw water intake and pumping station at the existing Corps of Engineers diversion dam at Great Falls. Construction of a 36-inch raw water supply main from that pumping station to a filtration plant at a suitable location somewhere east of Forestville with an initial capacity of 15 million gallons per day. Construction of a 36-inch supply main from that filtration plant to the storage tanks at Tyson's Corner.

Accredited engineering estimates of construction time for this development would be 30 months, as shown on the attached water service plan.

Based upon demand, the county would then be in a position to supply water by installing a 20-inch main to Sunset Hills, where a 1-million-gallon water storage tank would amply supply the proposed development at Sunset Hills, and from which storage an additional 16-inch main could then adequately supply the future needs of the town of Herndon. Construction of a 12-inch supply main continuing through the town of Herndon would then be sufficient to supply the proposed Chantilly Airport.

Potential

This stage II development will give Fairfax County a truly permanent water source from the Potomac, which, with expansion justifying demand, can meet all future county needs.

Fairfax County, 1958

WATER SERVICE PLAN—STAGE I

Development	Costs		Supply line—Service area	Service population	Construction time	Potential
	Construction	Other				
					Months	
20-inch supply line from Arlington County at Chain Bridge to Tysons Corner.	$555,000		From Chain Bridge (Arlington supply line) up Route No. 123, along CIA site, through McLean and Lewinsville to Tysons Corner.		15	Water supply and storage at Tysons Corner, the highest point in Fairfax County from which point water service can be supplied to any area in the county by gravity flow. This development also creates a supply which with adequate storage can service 75,000 people at an average daily flow of 6,000,000 gallons per day.
Pumping station at Lewinsville	90,000					NOTE.—Tysons Corner is the prime storage site in the county for an integrated water system at satisfactory water pressures and standards. Loss of Tysons Corner to any competing system would force abandonment of a countywide water service on a practical and possible basis.
2 million-gallon storage tanks at Tysons Corner set to elevation 600.	400,000					
36-inch supply main from Tysons Corner, paralleling circumferential B to the intersection of Gallows and Woodburn Rds., just below Fairfax Hospital site at northwest tip of the Annandale water service area.	780,000		From Tysons Corner, north of Vienna, along circumferential highway B east of Madrillion, west of Pimmit Hills, through Dunn Loring, Merrifield, and Chiles tract, east of Fairfax Hospital site. Thence continuing southward: east of Pine Ridge, Poplar Hills, Mill Creek Park, Wakefield to Fairfax Hills—all flanking the Annandale Water Co. service area, and including Tremont Gardens and Fenwick Park.	Year 1960: Total for Vienna, Madrillion, Pimmit Hills, Dunn Loring, Merrifield, Fenwick Park, Tremont Gardens, Pine Ridge, Poplar Hills, Mill Creek, Fairfax Hills, Wakefield Forest, and Annandale Water Co. area is 42,500.	9	The heart of a countywide system would now be established. Within 15 months, Fairfax County immediately makes adequate and improved water service available to 42,500 residents in the close proximity of this stage I artery water main. An additional potential is that the county is then in a position to advance to stage II of development, which potential is virtually unlimited.
Continuing with a 30-inch supply main from that intersection, paralleling circumferential highway B, Route No. 236.	150,000					
Extensions and distribution (including West Springfield).	1,590,000					SPECIAL NOTES
Refurbishment: Annandale Water Co., Pimmit Service Co., Tremont Gardens.	480,000					(1) With water supply and storage sites assured at Tysons Corner, Fairfax County would clearly be in a position to meet water demands for the towns of Vienna and Fairfax. Basic construction and facilities to meet this need would cost less than $1,000,000.
Acquisition: Annandale, Pimmit Service, and Tremont.		$2,000,000				(2) With a tie-in main to the Alexandria Water Co. at Back Lick and Keene Mill Rd. intersection, the
Contingencies:						
Land acquisition and rights-of-way.		100,000				
Engineering and legal		500,000				county would be in a position to supply

Acquisition: Annandale, Pimmit Service, and Tremont.	----------	$2,000,000				
Contingencies:						
Land acquisition and rights-of-way.	----------	100,000				
Engineering and legal	----------	590,000				
Interest during construction	----------	405,000				
Subtotal	4,045,000	3,095,000				
Total, stage I	7,140,000					

(2) With a tie-in main to the Alexandria Water Co. at Back Lick and Keene Mill Rd. intersection, the county would be in a position to supply water to 2 important development areas: West Springfield and the Pohick watershed. Basic construction of a 20-inch main along Keene Mill Rd. into West Springfield would cost less than $100,000. This measure would insure holding a potential 3,100 water connections for future Fairfax County services in that area.

Equally future demands would justify further extension of this water service into the Pohick watershed area.

WATER SERVICE PLAN—STAGE II

Raw water intake and pumping station at existing Corps of Engineers diversion dam at Great Falls.	$400,000	----------	Raw water from the Potomac River above Great Falls to filtration plant east of Forestville. Supply trunk down Old Dominion Dr. to Spring Hill, then to Oderick's Corner, to Tyson's Corner storage tanks.	----------	30	This development gives Fairfax County a permanent water source from the Potomac River which, with expansion justifying demand, can meet all future county needs. It means that Fairfax County, equipped with a permanent water supply and prime storage location, fulfills all prerequisites needed for development of an integrated water system to serve at least 200,000 people.
36-inch raw water supply main from pumping station to filtration plant (15 million gallons per day).	1,950,000	----------				
36-inch supply main from filtration plant to storage tanks at Tyson's Corner.	810,000	----------				
20-inch supply main to 1 million gallons per day storage tank at University site, Sunset Hills.	695,000	----------	From filtration plant to Colvin Run then along Route No. 7 to Brown's Chapel, past Sunset Hills to storage at university site. From there to the town of Herndon.	----------	9	Fairfax County could insure water service to the Sunset Hills area development where the owners of said area propose the growth of a small city around the university site. The town of Herndon will eventually convert its present water supply to a more dependable source to meet prospective industrial and residential growth.
16-inch supply main to town of Herndon.	132,000	----------				
12-inch supply main to Chantilly Airport.	198,000	----------	From Herndon, along Route No. 28 to north of Floris, then due west to airport terminal.	----------	4	Essential industrial demands can be met by Fairfax County to serve the entire area needs, which the location of the airport will presumably create.
Extension and distribution: Reserve fund.	1,500,000	----------				
Contingencies:						
Land acquisition and rights-of-way.	----------	$100,000				
Engineering and legal	----------	852,000				
Interest during construction	----------	821,000				
Subtotal	5,685,000	1,773,000				
Total stage II	7,458,000					

Primarily, it means that Fairfax County, equipped with a permanent water supply and prime storage location, fulfills all prerequisites needed for development of an integrated water system based upon a future service population of at least 200,000 consumers.

In addition, Fairfax County can insure water service to:

1. The Sunset Hills area development, where the owners of said area propose the growth of a "small city" around the university site.

2. The town of Herndon, which seems due to experience rapid growth development, and may eventually need to convert its present well water supply system to a more dependable source of water so as to meet major industrial and residential growth.

3. The proposed industrial demands emanating from the location of the Chantilly Air Terminal at the Loudoun-Fairfax County line.

SPECIAL NOTE.—(*a*) With water supply and storage sites assured at Tyson's Corner, Fairfax County would clearly be in a position to meet water demands for the towns of Vienna and Fairfax. Basic construction and facilities to meet this need would cost less than $1 million.

(b) With a tie-in main to the Alexandria Water Co. at Backlick and Keene Mill Road intersection, Fairfax County would be in a position to supply water to these two important development areas. Basic construction of a 20-inch main along Keene Mill Road into West Springfield would cost less than $100,000. This measure would insure holding a potential 3,100 water connections for future Fairfax County service in that area.

Equally, future demands would justify further extension of this water service into the Pohick watershed area, perhaps the county's next major residential development.

With expansion of the water facilities in the stage II, the county can supply all the lines in the Alexandria water system within Fairfax County, as well as such companies as Fairfax Hydraulics, Woodlawn Water Co. and the rest of the existing 10 private water suppliers in Fairfax County.

Of course, these systems could initially be served by the Occoquan filtration plant (if water can be had at a reasonable rate) but eventually would be served from our Potomac River supply.

In any case, this interlooping of pipe mains will provide the favorable feature of a dual water supply source—the Occoquan and the Potomac—a feature which has been strongly urged for the benefit of our general area by the State of Virginia, Civil Defense Office.

IV. SUMMARY

The future development of Fairfax County hinges essentially on its economic welfare and its status as a political entity. In this regard, a well-planned, countywide water service clearly plays a vital role.

Control and service of such a crucial public utility not only helps to determine the outcome of annexation suits, but it materially serves the necessary development of the county, which in turn, favorably affects the jurisdiction's tax base.

The initiative to create such a water service, leading to the development and utilization of a permanent water source, is at hand. But it will not remain so for much longer.

Competitive interests, principally the city of Falls Church and the town of Fairfax, are now seriously at work to expand their water service into Fairfax County. If their plans are allowed to proceed by county inaction and default, the chance to create an economically feasible Fairfax County water system may very well be lost forever.

As to tax-relief development, one fact is historically clear: The county cannot hope to attract desirable industry if it does not have control and the prime right of decision over a permanent water supply source to offer such industry.

This committee urges a speedy plan of action for creating a water service in the county which encompasses this broad objective. It urges the recently created county water authority to proceed at once toward solidifying the county's opportunity for establishing a feasible water system to serve our present and future needs. And it respectfully solicits the Fairfax County Board of Supervisors to offer their time, talents and encouragement to the authority to realize the goals herein set forth.

The work of this committee will have been well worth the time and effort expended by each individual member if progress toward the ends herein described can be given new impetus and vitality, so that the full benefits of an integrated water system for Fairfax County and its residents can be secured.

SUPPLEMENTARY REPORT—A PROPOSED WATER SYSTEM FOR FAIRFAX COUNTY, VA.

Issued March 10, 1958, by the Committee for a Fairfax County Water System, McLean, Va.

WATER NEEDS AND SUPPLY—THE YEARS AHEAD

The following is a discussion of the water-supply problems of the Virginia segment of the Washington metropolitan area, with special reference to Fairfax County. It is based on the assumption that the county's purpose is to integrate all independent water systems now operating in Fairfax, and to replace well-water sources with a central water supply.

Supplementing the recently issued Public Report on a Proposed Water System for Fairfax County, this study is based on additional research and discussion with engineering and municipal officials previously mentioned, to whom the committee expresses its gratitude.

Three illustrations accompanying this supplementary report in the form of graph charts. The report, viewing the problem on a regional basis, seeks to bolster the case for prompt planning of a permanent water-supply installation in Fairfax County as a prime site above present sewer effluent outlets.

Taking 1965, 1980, and 2000 as reference years of population growth and consumer demand, the committee submits the following general conclusion in the same public spirit of cooperation and help to the Fairfax County Water Authority and to the county board, which underscored its initial report:

The northwest area of Fairfax County above the local sewer effluent outlets is the region's prime location for creating a feasible and long-range permanent water-supply installation at the Potomac River.

Planning for this has been long overdue and should start at once for the following reasons:

1. Arlington County cannot be expected to provide water for any other area but its own because its facilities will soon reach their maximum safe capacity.

2. Consumer demands in Alexandria, Fort Belvoir, and Prince William County on the present facilities of the Alexandria Water Co. at Occoquan Creek will exceed capacity by 1966. Similarly, consumer demands on facilities now under construction will exceed capacity by 1975.

3. Maximum capacity of increased facilities owned by Falls Church (36-inch main at Little Falls Dam) will be 40 million gallons per day. Consumer demand under present direction of growth in the city and within Fairfax County will exceed this capacity by the year 1965.

Clearly, an adequate installation for water supply in the northern Virginia region is going to be needed soon from the area's largest and major permanent source: the Potomac River.

The alternative is a prospect of increasingly serious water shortages in the years ahead—not for want of a raw water source, but for lack of foreplanning to provide sufficient plant construction and distribution facilities.

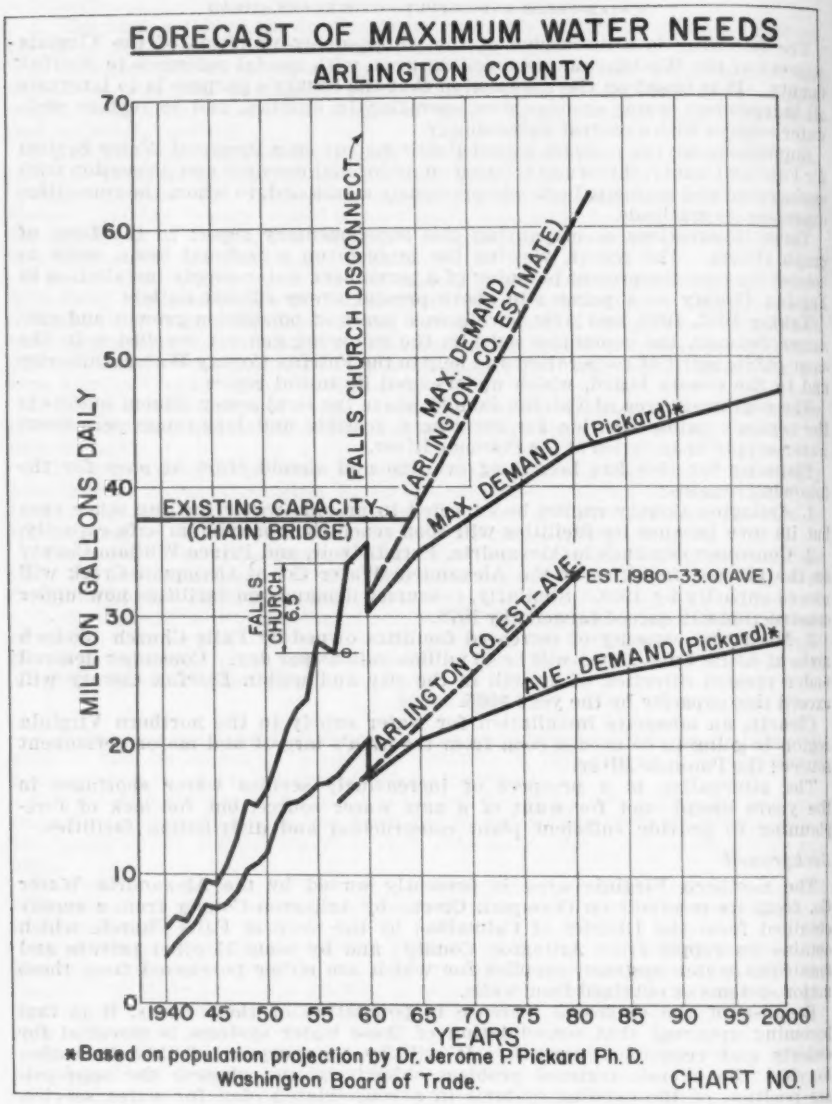
Background

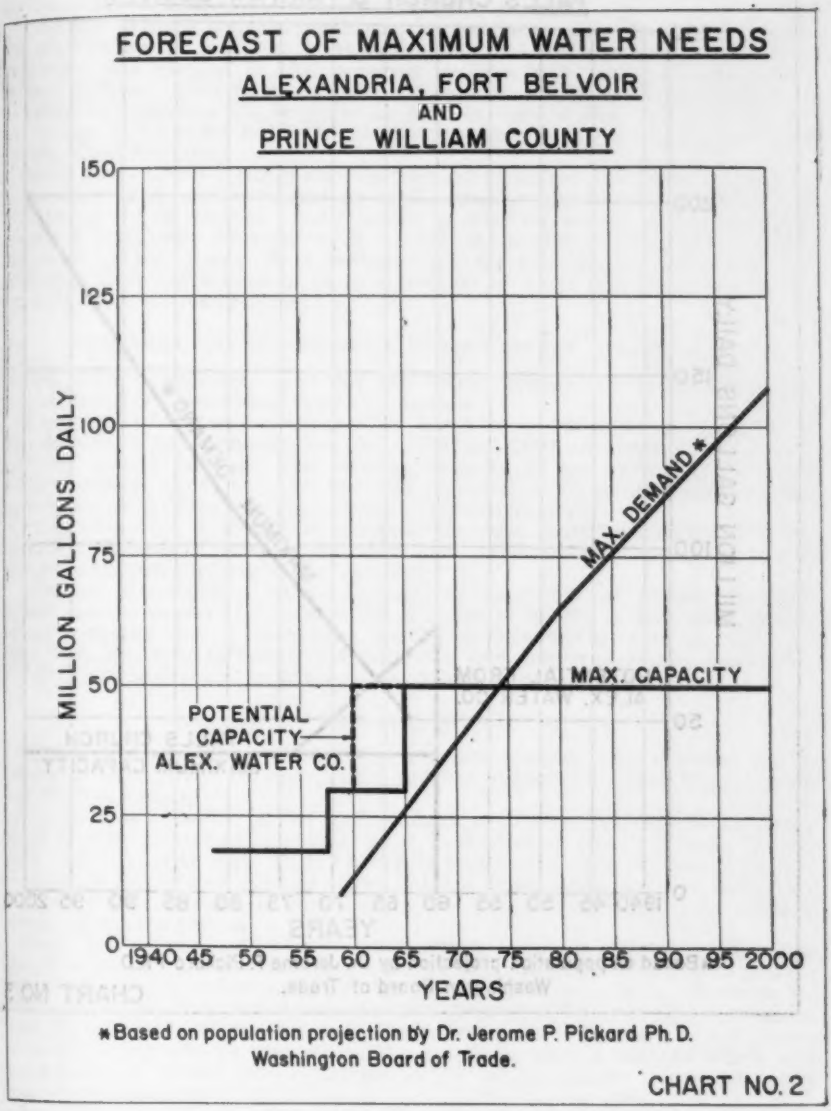
The northern Virginia area is presently served by the Alexandria Water Co. from its reservoir on Occoquan Creek; by Arlington County from a supply obtained from the District of Columbia; by the town of Falls Church, which obtains its supply from Arlington County; and by some 15 other private and municipal water systems, supplies for which are either purchased from these major systems or obtained from wells.

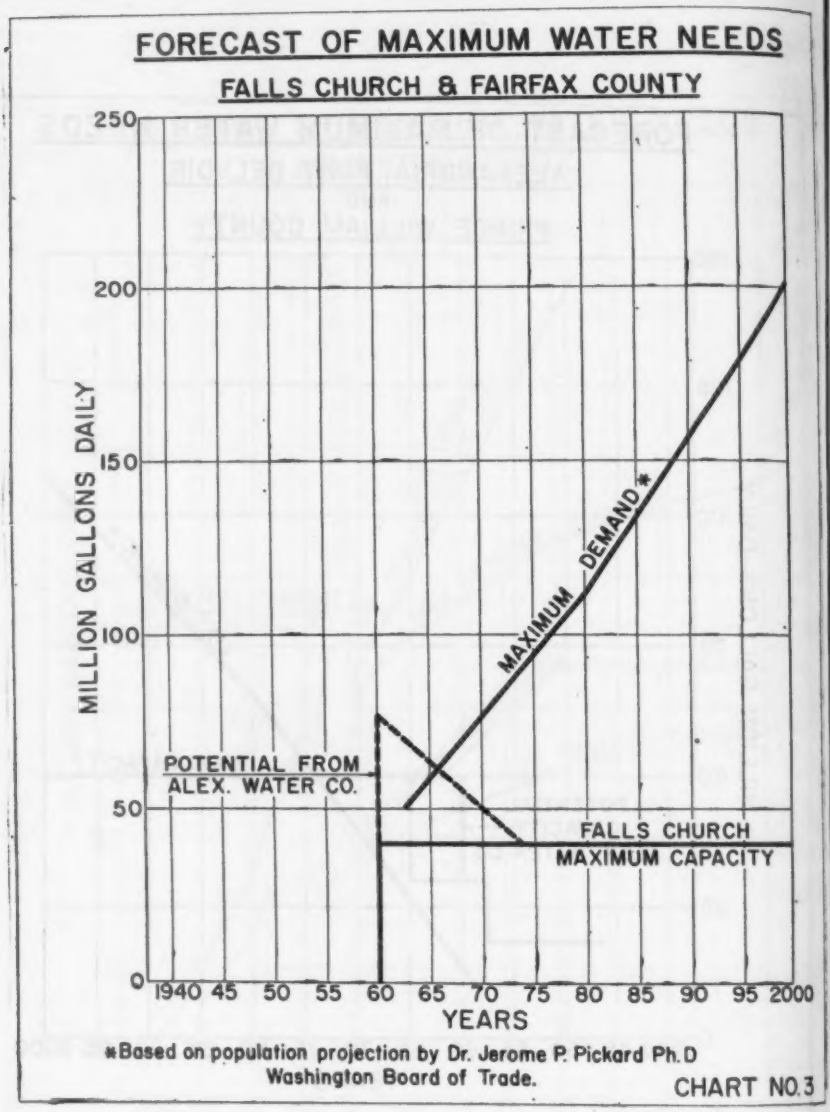
Because of the explosive increase in population of these areas, it is fast becoming apparent that consolidation of these water systems is essential for orderly and economical growth. It will be the purpose of this discussion to view the overall regional problem objectively and observe the appropriate position of the existing systems in a consolidated plan for water service.

Such a study requires a forecast of population growth and distribution. The best available is generally believed to be that of Dr. Jerome P. Pickard, Ph. D., of the Washington Board of Trade. Utilizing his population figures, the committee has applied standard rates of water consumption per person over given years ahead. The resulting total water demands for the political subdivisions of the area for the years 1965, 1980, and 2000 are shown on table No. 1.

From these data, water requirements for 3 major service areas have been plotted on charts Nos. 1, 2, and 3, which areas may be considered separately as being logically independent within the whole.


FORECAST OF MAXIMUM WATER NEEDS
ARLINGTON COUNTY
MILLION GALLONS DAILY
70
60
50
40
30
20
10
0
FALLS CHURCH DISCONNECT
MAX. DEMAND (ARLINGTON CO. ESTIMATE)
MAX. DEMAND (Pickard)*
EXISTING CAPACITY (CHAIN BRIDGE)
FALLS CHURCH 6.5
EST. 1980-33.0 (AVE.)
ARLINGTON CO. EST.-AVE.
AVE. DEMAND (Pickard)*
1940 45 50 55 60 65 70 75 80 85 90 95 2000
YEARS
*Based on population projection by Dr. Jerome P. Pickard Ph. D. Washington Board of Trade.
CHART NO. 1


FORECAST OF MAXIMUM WATER NEEDS
ALEXANDRIA, FORT BELVOIR
AND
PRINCE WILLIAM COUNTY
MILLION GALLONS DAILY
150
125
100
75
50
25
0
MAX. DEMAND*
MAX. CAPACITY
POTENTIAL
CAPACITY
ALEX. WATER CO.
1940 45 50 55 60 65 70 75 80 85 90 95 2000
YEARS
*Based on population projection by Dr. Jerome P. Pickard Ph. D.
Washington Board of Trade.
CHART NO. 2


FORECAST OF MAXIMUM WATER NEEDS
FALLS CHURCH & FAIRFAX COUNTY
MILLION GALLONS DAILY
250
200
150
100
50
0
MAXIMUM DEMAND*
POTENTIAL FROM ALEX. WATER CO.
FALLS CHURCH MAXIMUM CAPACITY
1940 45 50 55 60 65 70 75 80 85 90 95 2000
YEARS
*Based on population projection by Dr. Jerome P. Pickard Ph. D Washington Board of Trade.
CHART NO. 3

ARLINGTON COUNTY (CHART NO. 1)

Arlington County obtains its supply from the District of Columbia at Chain Bridge. It distributes it almost exclusively to consumers within the county, but presently furnishes water wholesale to Falls Church.

Utilizing existing supply facilities, the maximum capacity of the Chain Bridge pipeline for Arlington is approximately 37.5 million gallons daily. The maximum day demand in 1957 occurred in July with a record high of 33.7 million gallons. This figure includes 6.5 million gallons to Falls Church.

Arlington considers its facilities to be fast approaching the available capacity and has advised Falls Church that it cannot supply water to that city's system after July 1960.

Chart No. 1 shows Arlington's own forecast of future demand. It is shown in contrast to projections using Pickard's smaller population estimates. The differences are of interest. But, since it is generally evident that Arlington's system is essentially independent of the rest of the area, it need not be further discussed at this time. It is sufficient for the moment to understand that Arlington does not appear to be in a position to assist materially in any immediate relief of area problems.

ALEXANDRIA-FORT BELVOIR-PRINCE WILLIAM COUNTY (CHART NO. 2)

This area is presently—and for the future appears to be—primarily dependent upon the Alexandria Water Co. system.

A forecast of the water demand for this area is indicated on chart No. 2. The maximum day demands for 1965, 1980, and 2000 are, respectively, 27, 65, and 108 million gallons. The existing capacity of the system is about 30 million gallons daily, with an ultimate potential of 50 million gallons daily upon completion of the Occoquan Dam and treatment plant.

From chart No. 2, it will be observed that the 30-million-gallon daily consumption exceeds capacity in the year 1966. The 50-million-gallon daily consumption exceeds capacity in the year 1974.

(SPECIAL ENGINEERING NOTE.—Immediate completion of system facilities would provide excess system capacity of about 35 million gallons daily, diminishing annually due to increasing population demands to zero in 1974. At that time, the area system would require a new source of supply amounting, in 1980, to 15 million and in 2000 to about 60 million gallons daily.)

FALLS CHURCH-FAIRFAX COUNTY (CHART NO. 3)

The remaining portion of the Virginia metropolitan area demand is contained on this chart. Its distribution involves problems between Falls Church and Fairfax County.

The present capacity of the Falls Church system is, possibly, in the order of 10 million gallons daily—being, as it is, dependent upon Arlington County until 1960. At that time, Falls Church is expected to have completed its connections to the 36-inch conduit through Little Falls Dam, and will then have a maximum daily capacity direct from the District of Columbia of approximately 40 million gallons.

From the forecast curve of area needs (chart No. 3), it is apparent that this would be barely sufficient to supply the area demand if all of the small private companies were to be connected and the well supplies abandoned. However, by referring to chart No. 2, we observe that the Alexandria Water Co. has a potential capacity that could fill the gap until about 1965. After this date, a new source of water supply will be required in the county to serve a demand which will increase at an annual rate estimated at 3.5 million gallons daily and result in a total requirement of 160 million gallons a day in the year 2000.

In addition to this, the Alexandria Water Co. area deficiency starting in 1975 will increase to 60 million gallons daily in the year 2000, making a total Virginia metropolitan area deficiency in the year 2000 of 220 million gallons daily.

The problem

A new source of water supply of the magnitude here considered must come from the Potomac River. It could come through the District of Columbia system under certain conditions, as will be discussed, or it could be obtained directly from the river with treatment in Virginia.

The capability of the District of Columbia system, upon completion of the new filter plant and pumping station at Dalecarlia this year, will be 303 million gallons daily. In 1962, after construction of 10 additional filters, tentatively scheduled, the capacity will be 384 million gallons daily. With the presently connected loads of Arlington County at 37.5 million gallons and Falls Church at 40 million gallons more, the total connected load in the District in 1965 would be 325 million gallons daily.

Considering that the foregoing Dalecarlia capabilities are based on a degree of overload operation, the District of Columbia system would have reached its feasible limit by 1965. While it could possibly take on another 30 to 40 million gallons daily, it would be without much reserve.

If, in addition, it were to take on the anticipated Virginia load, then expansion in the District would have to be programed well in advance.

Considering the problems of the District in securing funds for capital outlay, such a program in the interests of Virginia residents might present some serious difficulties, to say the least. It, therefore, seems more appropriate to consider the other alternative of new treatment facilities in Virginia. This, in fact, would eliminate many problems of costly river crossings and, in the overall, could be less costly to Virginia consumers. It would also disperse the basic area water-supply resources in the interest of civil defense.

If this direction is taken, then the immediate decision is clear—develop an intake and treatment works on the Virginia side of the Potomac River at Great Falls.

CONCLUSION

It appears essential, in the interest of orderly area development, that the county assume the leadership for the promotion and construction of a coordinated water service in the Virginia metropolitan area.

Concurrent with the proposed acquisition of the previously mentioned small area systems (public report, March 3, 1958), there must be negotiation for service from the best and least costly source. It would appear that the Alexandria Water Co. would have the greatest short-term capability, but Falls Church must be considered in connection with systems in close proximity to its distribution lines.

There has been much public apprehension as to whether Fairfax County is losing the race for a countywide water system. The county has, indeed, made a slow start. But in the long run, it has all the elements in its favor if it keeps its vision on the Great Falls source of supply and if it can coordinate the activities of existing operating systems during this hectic period of adjustment.

SUMMARY

In the light of future consumer demands illustrated herein, it is urged that the county engage engineering services to plan a permanent and independent source of water supply from the Potomac River, plus a distribution system that will serve to tie in all the scattered systems and new development areas on a long term basis.

This will mean that the county must (1) acquire independent service areas as rapidly as it can abandon wells; (2) bring the distribution systems up to standard and secure a dependable supply of water at the Potomac River.

Finally, the creation and future expansion of a Fairfax County water system on a sound basis requires a common understanding with Alexandria, Falls Church, Vienna, the town of Fairfax, Herndon, the District of Columbia, and even possibly the State of Maryland, from whom permission must be obtained to expand future demands on the Potomac River supply.

The alternative to this regional consideration and approach may well defeat the county's opportunity in the years ahead to develop a satisfactory and economically beneficial water system.

RICHARD C. BAIN.
CARL D. SORESI.
D. V. C. BIRRELL.
BUN B. BRAY, JR.
CHARLES M. PLATT.

TABLE No. 1.—*Virginia-Washington metropolitan area—Estimated water consumption to 2,000*

WASHINGTON, D. C.

Year	Population	Gallons per day per capita		Total, million gallons per day	
		Average	Maximum	Average	Maximum
1965	890,000	173	277	154.0	246.0
1980	940,000	183	293	172.0	276.0
2000	1,000,000	193	308	193.0	308.0
ARLINGTON COUNTY					
1965	167,000	123	210	20.6	35.0
1980	190,000	132	225	25.1	42.7
2000	210,000	132	225	27.8	47.3
FALLS CHURCH					
1965	12,000	123	210	1.5	2.5
1980	15,000	132	225	2.0	3.4
2000	16,000	132	225	2.1	3.6
ALEXANDRIA					
1965	10,500	123	210	12.9	22.0
1980	125,000	132	225	16.5	28.2
2000	130,000	132	225	17.2	29.3
FAIRFAX COUNTY					
1965	318,000	90	162	28.6	57.5
1980	570,000	105	190	60.0	108.0
2000	900,000	120	220	108.0	198.0
PRINCE WILLIAM COUNTY					
1965					
1980	200,000	90	162	18.0	32.4
2000	389,000	105	190	41.0	74.0

Summary

[Million gallons per day]

Area	1965		1980		2000	
	Average	Maximum	Average	Maximum	Average	Maximum
Washington, D. C	154.0	247.0	172.0	276.0	193.0	308.0
Arlington County	20.6	35.0	25.1	42.7	27.8	47.3
Falls Church	1.5	2.5	2.0	3.4	2.1	3.6
Alexandria	12.9	22.0	16.5	28.2	17.2	29.3
Fairfax County	28.6	57.5	60.0	108.0	108.0	198.0
Prince William County			18.0	32.4	41.0	74.0
Fort Belvoir	3.0	4.5	3.0	4.5	3.0	4.5
Total	220.6	362.5	296.6	495.2	392.1	664.7
Total, Virginia	66.6	115.5	124.6	219.2	199.1	356.7

Representative HYDE. Our next witness is Mr. Straus.

STATEMENT OF ROBERT WARE STRAUS, ACCOKEEK, MD.

Mr. STRAUS. My name is Robert Ware Straus, and I am a resident of Accokeek, Md., on the tidewater area of the Potomac River 12 miles below Washington, and it is part of the metropolitan area. That is the major reason for my being here today.

As these are exploratory hearings, I think we should explore this part of the metropolitan area.

I am also president of a firm which has been active in the conservation and planning field, and have served the Interstate Sanitation Commission in the lower Hudson area as consultant over a period of 25 years.

Today, I am speaking on behalf of the Accokeek Citizens Association, the Accokeek Democratic Club, the Accokeek PTA, the Moyaone organization, the Piscataway Co., and several other Accokeek organizations which have passed resolution on the matters on which I will speak.

I have also been asked to speak on behalf of the Calvert Manor Civic Association and the Broad Creek Citizens Association. I have talked with the Mount Vernon Ladies Association on the Virginia side, and the National Park Service, which is the major landowner of the Virginia tidewater shore below Washington.

We have joined together in the Potomac Tidewater Council, which is a new organization to work with your committee. This council has one purpose; that is, to reaffirm to this committee that the river does not end at 14th Street.

All the comprehensive plans prior to this committee's studies, work their way down from the headwaters to 14th Street. They propose many improvements for the upper river. We have no argument for or against these proposals. However, these studies all agree on the fact that the river below Washington is foully polluted. It is a sewage lagoon, in which the raw, untreated sewage from the District and its Virginia neighbors washes back and forth, taking some 40 days to make the 12 miles to our locale.

The Army engineers in their report did a little better than some. They promised, if we would support their upper river work, to float the sewage down to us a little faster. "Get your sewage while it's fresh, fellows," seemed to be their slogan.

Representative HYDE. You mean they were trying to make a deal with you?

Mr. STRAUSS. Well, they wanted support. I don't think they offered us the good end of the stick in this case.

This committee's staff is to be commended for the first faint appreciation that people live down the river, and that two actions can be taken to help the downriver area:

First. The dumping of raw sewage by the District whenever it rains can be economically stopped.

Second. A subriver conduit can be built to take the fully treated effluent to a point in the river where it is wide enough and deep enough to accept the loads. Unfortunately, members of your staff pointed out an area in our neighborhood where the river is neither wide nor deep enough for the purpose, as the possible end of this conduit.

We appear here today to ask this committee to study the lower Washington metropolitan area as well as the upper. We invite the committee's attention to the fact that ours is the most rapidly growing section of the whole metropolitan area. We are deficient in everything—riverfront parks, transportation, communication, water, housing—all factors of modern metropolitan life—except raw sewage. That is supplied to us in quantity by our upstream neighbors.

We therefore earnestly request this committee to hold separate and special hearings on the forgotten metropolitan area—the tidewater area of the Potomac—where hundreds of thousands live now, where the major growth is taking place, and where millions will live—we hope in decent cleanliness.

Representative HYDE. Thank you, Mr. Straus.

I think you can be assured that the committee will take into consideration and make a study leading to, we hope, worthwhile recommendations with respect to your area.

Mr. STRAUS. Yes. This whole area is growing extremely rapidly, and it tends to be—because you big boys all live in the Northwest—a somewhat forgotten area.

We live south of the barrier down there.

Representative HYDE. Some pretty big boys live down your way, too.

Mr. STRAU. Oh, we don't think so.

Representative HYDE. Mr. Levin, do you have any questions?

Mr. LEVIN. Just one question. Mr. Straus, where in the consultants' reports did a statement appear recommending or suggesting discharge of sewage effluent in your area?

Mr. STRAUS. A week ago Saturday night on a television program called, Our Beautiful Potomac, there appeared a Mr. Levin to explain this plan for this conduit, and if I may show you on the map here, he laid his finger on the point down there just at Piscataway Creek, right opposite Mount Vernon. I believe you are familiar with this gentleman.

Mr. LEVIN. I am and I am sorry that his aim is not better.

Mr. STRAUS. I want to bring this point out. What did you mean?

Mr. LEVIN. Downstream.

Mr. STRAUS. Downstream how far?

Mr. LEVIN. That is just the question that was raised.

Mr. STRAUS. Well, I want to help you. What can we do to help you get it downstream to where the river is wide and deep enough?

Mr. LEVIN. You have done that now. Thank you.

Representative HYDE. Where do those who live along it consider it wide enough?

Mr. STRAUS. Below the island the river is approximately five times as wide there as it is at our point and it gets continuously wider from that point down.

The river is almost a sluice down from Washington.

Representative HYDE. You can assure us of no opposition?

Mr. STRAUS. I can assure you of opposition wherever you are. But I think Mr. Levin has answered the question here. I just wanted to make sure that his inadvertent putting of his thumb down did not mean that that is where he meant to dump this.

Representative HYDE. Thank you very much, Mr. Straus. We appreciate you coming here to give us the benefit of your testimony.

Mr. Petrie.

STATEMENT OF WILLIAM I. PETRIE, ACCOKEEK, MD.

Mr. PETRIE. Mr. Chairman, my name is William L. Petrie. I am the president of the Calvert Manor Civic Association. Calvert Manor is a subdivision located in Accokeek, made up primarily of owners that are building their own houses in sort of a do-it-yourself community and we have waterfront privileges; that is, property on the waterfront, the waterfront being in Piscataway Creek, almost directly across from Mount Vernon.

We had the feeling when we bought this property we were led to believe that this would be cleaned up so that it would be suitable for swimming, boating, and so forth.

Of course, it is suitable for boating now, but it isn't very good to get thrown overboard, so we are anxious and hope that consideration will be given in due time to the thesis that the river is a natural resource and should be protected so that people may use it in the way in which it is intended—for pleasure, swimming, fishing, and so forth—and we hope that it can be cleaned up to the point where it could be used for swimming in the future.

We feel that if money is spent on planning, and so forth, and the river is being used improperly upstream to the disadvantage of the people downstream, and you are deprived by their action, then it is our natural right to use the stream in the way it should or could be used.

Representative HYDE. Thank you, Mr. Petrie. We appreciate your comments and assure you we want to do everything possible to make your riverfront a suitable facility for all purposes and we will bend all our efforts to that end.

Do you have any questions? Thank you very much, Mr. Petrie.

Mr. Wagner.

STATEMENT OF CHARLES WAGNER, ACCOKEEK FOUNDATION, ACCOKEEK, MD.

Mr. WAGNER. I am Charles Wagner, Accokeek, representing the Accokeek Foundation which is concerned with the development of the area, especially along the riverfront, and we find ourselves in this position in the development of this property of continuing being faced with the fact that the river itself cannot be used, and the various programs which we have tried to develop or intend to develop do depend on the fact, our very property depends for its value to us and to the community, on the fact that it is on the river, some of it, so that we are particularly concerned—I just wish to reinforce the concern that has been expressed here, that the downriver people be given full consideration.

I personally speak as a nontechnical taxpayer, and as such we have the highest regard for the experts, and I feel that the experts underestimate their abilities to find ways of solving the problem.

Representative HYDE. Technically, you are a taxpayer, though.

Mr. WAGNER. Technically, I am a taxpayer, yes, sir, and I just wanted to reinforce the feeling that the downriver on the Potomac side is a splendid possibility for planning and development, and so many of the mistakes that have been made in other areas around town need not be made in our area.

One other point I would like to make is that we feel, and I think it has been demonstrated, that some sort of larger authority will be necessary with considerable help.

Just in the past few weeks, the county commissioners of Prince Georges County have demonstrated that they require considerable needling and assistance, financial and otherwise, from a larger authority in order to avail themselves of the possibilities which exist now, but which are rapidly diminishing; namely, park lands, and so forth, and so forth.

And I think the county commissioners need very badly to be backed up by a larger metropolitan authority.

Representative HYDE. Your group, then, does endorse the broader regulatory authority for the region?

Mr. WAGNER. Yes.

Representative HYDE. Thank you, Mr. Wagner, very much.

Any questions, gentlemen?

(The following was supplied for the record:)

COUNTY COMMISSIONERS,
PRINCE GEORGES COUNTY,
Upper Marlboro, Md., April 24, 1958.

Hon. ALAN BIBLE,
United States Senate Office Building,
Washington, D. C.

DEAR SENATOR BIBLE: I am informed that there will be a joint congressional meeting Wednesday and Thursday in the interest of the elimination of the pollution of the waters of the Potomac River as it passes Washington City and our county to the south. I understand that Mr. Gilbert Levin, an engineer, has proposed a plan that will accomplish this end, and I take this means of advising you that the commissioners and people of Prince Georges County are most enthusiastically behind any effort on the part of the Congress to eliminate the serious situation that exists in the Potomac as it passes the shores of Prince Georges County.

Thanking you for your report, and trusting that much shall be accomplished by the efforts of those who are leading this improvement, I am

Yours very respectfully,

HERBERT W. REICHELT, *President.*

Mr. GUTHEIM. Mr. Chairman, I would like to insert in the record at this point two letters, one from the Chief of Engineers and the other from the Secretary of the Interior, commenting on what has been several times mentioned earlier today, the technological development of methods of treating water and of sewage disposal.

Representative HYDE. They will be received in the record at this point.

(The documents referred to are as follows:)

February 18, 1958.

Mr. FREDERICK GUTHEIM,
Staff Director, Joint Committee on Washington Metropolitan Problems,
Congress of the United States, Washington, D. C.

DEAR MR. GUTHEIM: Your letter to the Secretary of Defense of December 20, 1957, concerning water supply and pollution problems of metropolitan Washington has been referred to the Chief of Engineers of the Department of the Army for his consideration and direct reply. You request information on programs of the Department of Defense which go beyond present conventional methods

for treatment of water. You also request comment concerning the maintenance of water supply in the event of an attack with modern weapons.

The Departments of the Army, Navy, and Air Force are, of course, all deeply interested in the development of methods of producing potable water, both by the desalinization of sea water and the purification of contaminated supplies. The research and development work underway within the Department of Defense is, quite naturally, directed primarily toward the development of methods and devices for field military use and on board ships. However, the basic research findings have wide application and the engineers and scientists of the Department of Defense maintain close liaison with developments outside the Military Establishment and exchange information with technical personnel in other agencies.

The major research and development activity in this field within the Department of Defense is being carried out by the Corps of Engineers of the Department of the Army. The corps now has underway considerable work having to do with surface water purification, sea water desalting, brackish water demineralization and decontamination of water containing chemical, biological, or radioactive contaminants. Enclosure 1 includes discussion of these activities. In brief, it may be concluded from these investigations that presently known methods of purification are capable of rendering potable water from sea water and contaminated supplies, but that generally such methods are extremely costly and cannot be justified at this time for large municipal water supply systems such as that for the District of Columbia, except possibly to furnish emergency supplies in the event of a breakdown of the municipal system.

Your second request touches upon a matter of vital concern to the Corps of Engineers for the reason that the district engineer of our Washington district has direct responsibility for supplying water to the District of Columbia. The corps also provides engineering support to the Federal Civil Defense Administration and, in that capacity, may be called upon to assist in restoring water service should an attack destroy or disrupt a municipal system.

In connection with the general problem of furnishing water to cities subsequent to nuclear attack, it is generally accepted that radioactivity in water is the result of suspended radioactive material, rather than by radioactivity of the water molecule itself. Thus, in the event of an attack on a metropolitan complex, resulting in disruption of normal water supply services, it is likely that military equipment and procedures such as described in enclosure 1 would be applicable to the provision of emergency supplies necessary for human internal use. The major problems involved would be the availability of standby equipment for decontamination and distribution. The latter aspect may be accomplished through the use of tank trucks to deliver potable water to established distribution centers or, possibly, even directly to consumers. The availability of ground-water supplies and of water stored in covered reservoirs would also be of utmost importance. Properly located and constructed wells do not become contaminated by radioactive fallout under normal conditions.

With respect to the specific problem of providing water to the metropolitan Washington area, the district engineer has carefully studied the many problems involved in maintaining and operating the water system during and following a nuclear attack. To the extent practical at this time, his planning includes consideration of conditions that might prevail as a result of enemy attack or sabotage, the possible measures that might be taken to make emergency supplies available for essential use, the vulnerability of important elements of the existing water supply system and the measures that might be taken to restore the system if disrupted. These conditions are outlined in enclosure 2. Generally, it may be concluded that emergency water supplies would be provided initially to meet minimum needs of civil-defense and other workers not evacuated. Restoration of the existing system would necessarily wait until the area is safe for work crews to enter.

With regard to the provision of emergency supplies, surviving portions of covered storage in the District of Columbia and in the Washington Suburban Sanitary District with an overall total of about 240 million gallons may be available for potable use. Additional limited supplies could be obtained from numerous wells in the metropolitan and surrounding area, and through use of the portable water-treatment units discussed in enclosure 1. Tank trucks would be required for distribution of water to control points.

The problem of restoration of the existing system is necessarily complicated by a number of considerations. In case of a maximum blast within the primary target area of downtown Washington, it may be assumed that destruction would

be so extensive that reuse of the areas would be delayed possibly for a period of several months or longer. It is conceivable that heavily populated areas would be burned out, building connections would be broken, causing distribution mains to be emptied within a few hours, and sewage would flood the streets. Sanitary conditions probably would be at their worst throughout the lower areas of the city. Thus any reentry of the population of the area would depend on alleviation of unsatisfactory sanitary conditions as well as a reduction in radioactivity generally to tolerable limits.

Probably the Federal Civil Defense Administration, adjoining States and nearby cities would have to be called upon to furnish labor, equipment, and materials if it should be found desirable to restore water service in the devastated area. No single city or Government agency could justify procurement and remote storage of the materials necessary to restore utility services in areas subjected to attack by nuclear weapons. In case the water-system-operating personnel are unable to return after evacuation, the labor force necessary for restoration would have to be drawn from other utility systems. It is most likely that such support could be obtained through the American Waterworks Association and its member organizations located throughout the United States and Canada. Included in its membership are all classes of engineers, consultants, manufacturers plant operators, construction experts, chemists, bacteriologists, etc., concerned with the water industry.

Consideration has also been given to the possibility of reducing the danger of the Washington water supply becoming radioactive by the construction of storage reservoirs as far as possible from the metropolitan area. It was found that this would not materially effect the risk for the following reasons:

(*a*) It is extremely unlikely that dams will be the targets of nuclear weapons. The chances of a hit are even less. Hence, location is not an important factor.

(*b*) Most radioactive material will come from runoff originating on the contaminated lands of the drainage areas, not from fallout on the reservoir itself.

(*c*) Attack by nuclear weapons is not the sole, or even necessarily the greatest, source of danger. Bacteriological warfare and the use of poisons must also be considered. A dispersion of storage would only make this problem more difficult.

In summary, I would like to emphasize the following points:

1. The cost of purifying water by distillation or any of the other methods developed for desalting sea water is now prohibitive and there is little prospect that it can ever be reduced to the point at which it would become competitive with present methods for purification of city water supplies.

2. Planning for suppling water to the Washington metropolitan area subsequent to attack by modern weapons has received a great deal of study, and can go no further until such time as certain controlling decisions are reached at top levels of Government.

3. If the metropolitan area should be subjected to attack by long-range missiles, the location of water-supply reservoirs would not be an important factor.

4. The possibility of sabotaging water supplies by injecting bacteria or some of the newly developed poisons into the system must be taken into account. The major problem would be in detection before widespread damage is done to the civilian population.

I trust that this information will be helpful to the committee in its studies of metropolitan Washington problems. If I may be of any further assistance in that regard, please do not hesitate to call upon me.

Sincerely yours,

E. C. ITSCHNER,
Major General, United States Army, Chief of Engineers.

SUMMARY OF THE CORPS OF ENGINEERS ON RESEARCH AND DEVELOPMENT ACTIVITIES IN WATER TREATMENT

1. *Progress in conventional treatment of water.*—During the past decade significant progress has been made in adapting the principles of solids contact precipitation to water clarification. To meet military field requirements a device was developed by the Engineer Research and Development Laboratories that effectively clarifies surface water in from 10 to 25 percent of the time required in conventional settling basins. The device, called an Erdlator, appears to be particularly effective in handling heavily polluted water and meets the requirement for relatively small water-treating facilities. This development suggests that solids contact clarifiers could be developed that would extend the performance of the conventional coagulation process and reduce the size and cost of con-

ventional plant facilities. The Erdlator has been used with both sand and diatomite filters to produce reliable and efficient "packed water plants" to meet military field requirements. Recently several waterworks equipment manufacturers have begun to offer "packaged plants" in the civilian trade. Such plants offer a potential answer to the problem of supplying water to small population centers scattered over a large area in which suitable raw water sources are available. Decentralized water treating facilities may offer some advantages from the point of view of civil defense.

2. *Diatomite filters.*—Water filters using diatomaceous silica as the filtering medium were first developed in this country by the United States Army Corps of Engineers during World War II. They are in general use today for the clarification of swimming pools and have been successfully used in a number of instances on small municipal water systems. The military experience with these filters suggests that their full capabilities have not yet been developed with respect to use in municipal practice.

3. *Distillation.*—Distillation equipment for desalting sea water is used by both the Department of the Army and the Department of the Navy. Vapor-compression equipment is preferred for most land-based installations and aboard submarines, while multiple-effect stills and other equipment using boiler steam for the heat source are common on seagoing vessels. The United States Army Corps of Engineers pioneered the application of the vapor-compression principle to sea-water desalting early in World War II. Since 1945 work by the military services has resulted in major improvements in the technology. In addition to improving field-equipment designs, vapor-compression equipment has been developed for use at permanent military installations. For example, a 4-unit plant rated at 8,800 gallons per hour is a major part of the water system at Kindley Air Force Base, Bermuda. Performance of this plant is satisfactory. Approximately 280 pounds of distillate are produced for each pound of fuel oil consumed in the diesel prime movers. Our experience with sea-water distillation justifies the following conclusions:

(*a*) Production of drinking water from the sea by distillation is technically feasible now.

(*b*) Distillate is not now and probably will never be cheap water.

(*c*) The major unsolved problem areas in distilling sea water are corrosion, scaling, and first cost of required equipment.

(*d*) Cheap power would not necessarily result in cheap water. For example, within the limitations of known technology, distillate would still be costly by ordinary standards if power costs were reduced to zero.

(*e*) Distillation of sea water using nuclear fuel is technically feasible now. In fact, distillation can be readily accomplished with any heat source that can heat water to 190° or above.

(*f*) The distillation of water from rivers, harbors, and related sources is adversely affected by large amounts of suspended solids and dissolved silica, high alkalinity, gross organic pollution, and chemical wastes.

(*g*) With minor exceptions chemical, biological, and radioactive contaminants are removed from water by distillation.

(*h*) Distillation is the only practical method now available for desalting sea water.

The current Corps of Engineers research program includes a study of a method showing promise in reducing the scaling rate in sea-water stills. Also under study is the application of selected aluminum alloys in the construction of stills. Success in this study would have far-reaching effect on the size and cost of distillation plants.

4. *Demineralization of brakish water.*—The Military Establishment is concerned with the demineralization of water containing up to 10,000 parts per million of dissolved solids. For water containing upward of 2,000 parts per million, ion exchange resins are being studied. For higher concentrations ion selective membranes (electrodialysis) have shown promise. Ion exchanges resins can be used to produce water approaching distillate in quality and are effective in removing many chemical and radioactive contaminants. Electrodialysis appears better applied where it is desired only to reduce the solids to within the limits of human tolerance. In both processes performance is limited to the removal of dissolved materials. Both processes must be preceded by other treatment to remove essentially all suspended matter from the applied water. Experience to date with these processes suggests that electrodialysis in conjunction with conventional water treatments may permit the use of water from tidal sources and chemically contaminated (wastes) water that cannot now be considered as a

water source for municipal use. Considerable additional research and pilot-plant studies are required to define fully the capabilities of these demineralization processes.

5. *Water decontamination.*—The Military Establishment must be prepared to remove chemical, biological, and radioactive contaminants from water on the battlefield. Significant chemical (war gases) contamination of large water sources is not considered likely either on the battlefield or in the Zone of the Interior. Conventional water treatment employing coagulation, filtration, and chlorination provides an encouraging level of protection against bacteriological contamination. Potential problems in this area do not appear significant. (Sabotage of distribution systems should not be overlooked.) Radioactive bomb debris can contaminate even large water sources. Of the material falling out on a watershed only a small fraction will become dissolved in the runoff. The remainder will remain in the soil or will appear as suspended solids in the runoff. For this reason any process that removes essentially all suspended matter will materally reduce the overall level of contamination. The importance of the material in solution must be evaluated in terms of the amount present, its age (time since detonation), length of time it will be consumed, and accepted levels of human tolerance. Removal of such dissolved radioactivity is accomplished only by a process that reduces the total dissolved solids in the water. Ion exchange, softening processes, and distillation are among the available techniques.

6. *Sterilization with radiation.*—The sterilization of water, sewage, and sewage sludge by gamma radiation has been studied by the Engineer Research and Development Laboratories and reported in the technical literature. While these materials can be sterilized, it is not possible at this time to anticipate the future importance of this technical capability.

Outline Plans for District of Columbia Water Supply Operations in Event of an Attack With Modern Weapons on the Metropolitan Area

I. VULNERABILITY OF PHYSICAL PLANT

1. *Collection system*

(*a*) Two thousand eight hundred and seventy-seven-foot masonry diversion dam at Great Falls. Could not be protected against modern weapons but direct hit not anticipated.

(*b*) Two 9-mile raw-water conduits with combined capacity of 215 million gallons per day. Could not be protected against modern weapons but, on account of cut and cover construction, service could be reestablished with open trenches except at bridge sites, where metal pipe siphons could be installed to carry partial flow.

(*c*) Forty-six-acre open Dalecarlia receiving and settling reservoir with 7-foot diameter bypass. Total capacity at elevation 149.0 is 237 million gallons. Partial drainage can be accomplished through Georgetown conduit and hydro station penstock. Could not be protected; however, direct hit would be required for destruction.

(*d*) Hydroelectric power generating station with two 1,500-watt units that can be converted into pumping units with combined capacity of 90 m. g. d. for pumping raw water into Dalecarlia plant. Hydro plant is in protected location and blast damage is not anticipated. If adequate raw water were available, generators could provide power for Dalecarlia filter plant operation and for operation of a pumping unit on one of the city's distribution service.

(*e*) Four hundred and fifty m. g. d. pumping station at Little Falls with 4,300-foot raw water tunnel discharging into Dalecarlia open reservoir, now under construction. The pumping station is so located that it is protected against anything but a direct hit. Damage to tunnel is not anticipated. Combustion engine-driven pumps could be connected to the tunnel for pumping limited supply of raw water into Dalecarlia Reservoir.

(*f*) Two-mile conduit between Dalecarlia and Georgetown Reservoir, cut and cover brick construction. Disruption not anticipated. Open trench flow could be established to restore any blast damage. If undamaged, the conduit will contain about 5 million gallons of raw water.

(*g*) Forty-two acres open Georgetown 3-section sedimentation reservoir with 7-foot diameter bypass and facilities for drainage and interconnection to city low service distribution system. Total capacity at elevation 146.0 is 226 million gallons. Radiological contamination would require drainage of reservoir and

refilling. A direct hit would cause serious damage with little likelihood of restoration. However, nearby concrete and metal distribution mains underlying MacArthur Boulevard might be used to restore partial bypass service.

(*h*) Four-mile tunnel, 9 feet in diameter, between Georgetown and McMillan Reservoirs with interconnection to city low service distribution system at McMillan east shaft station. Could not be damaged readily except by direct hits over structure at Gergetown Reservoir, Rock Creek, Champlain Street station, and east shaft station.

(*i*) Thirty-eight-acre McMillan Storage Reservoir with facility at east shaft station for partial drainage into city sewer system. Total capacity at elevation 147.2 is 292 million gallons. Reservoir is susceptible to radiation from air blast, difficult to drain and dilute, and would be rendered unserviceable from a direct hit. The latter probably would destroy or damage greatly the McMillan filter plant low-lift pumping and the city's Bryant Street pumping station.

2. Purification facilities

(*a*) The Dalecarlia rapid-sand type filter plant is protected naturally from blast in the Washington downtown area. Extensive damage from air blast is not anticipated. A direct hit would curtail all water supply service activities for several months probably but, if undamaged, it could supply the city and Arlington County, Va., with restricted water supply. Upon evacuation shutdown, 7 to 25 million gallons of finished water would be stored in the plant reservoirs.

(*b*) The McMillan slow-sand filter plant is ill protected from any blasts in the downtown area, except for its spread underground construction. Any direct hit would make it untenable for a considerable period and restoration as such would probably not be economical.

(*c*) Electric power delivered at 13.2 kilovolts and reduced in voltage as necessary is required for operation of both filter plants. Three underground and two overhead lines supply Dalecarlia. Two underground sources supply McMillan.

(*d*) Chemicals in sufficient quantities to treat the water conventionally over long periods of time are not stored at the filter plants. Bauxite and sulfuric acid are stored at Dalecarlia for the manufacture of alum sirup, a coagulant, in amounts to treat the raw water for a 2-month period generally. Crystal alum is stored at Dalecarlia to provide 2 to 10 days of treatment. Lime is stored at both plants but only for 2 to 10 days of treatment. Chlorine is delivered in ton cylinders to McMillan and railroad tank cars to Dalecarlia and is difficult for dependable storage of more than 2 to 10 days. Other chemicals, such as SO_2, $NaClO_2$, and $CuSO_4$, are carried in stock but of insignificant quantities for prolonged treatment. Any nationwide attack would interfere probably with commercial transportation of chemicals. Chemicals, such as $FeSO_4$, NaOH, Na_2CO_3, and the silica gels that are especially suitable for treatment to reduce radiation contaminants are not carried in stock and suitable storage and feeding facilities for their stockpiling and application are not available nor contemplated in future construction to assure adequate treatment against considerable radiation of the source water. These chemicals are expensive and not required for normal water treatment. Their use during an emergency might be useful but not essential for immediate contingencies. Procurement during reconstruction period should be considered.

3. Pumping facilities

(*a*) Electric power at 13.2 kilovolts must be provided at both plants. For operation of the pumping plants for the new Little Falls raw water pumping station, power at 1.5 kilovolt-amperes is necessary as delivered by an overhead line. The hydro station could provide 2.5 kilovolts at 2,300 volts through bypassing about 140 m.g.d. of raw water to that station but this station could furnish such power only to Dalecarlia plant.

(*b*) The McMillan low-lift station that delivers water from the reservoir to the filter is susceptible to blast from the downtown areas.

(*c*) The Dalecarlia raw water booster station, presently operating high service station, hydro plant, new high service station under construction, and Little Falls raw water station under construction, are naturally protected from downtown area blasts.

(*d*) The new high service station, now under construction, except for the transformers and headhouse entrance, is underground and houses 15 pumping units with installed capacity of 477 m.g.d. It has considerable protection from any blasts other than direct hits in the immediate Dalecarlia plant area. The new Little Falls station except for its prestressed access bridge and transformer housing is rugged and considered to be in a protected vantage point.

(*e*) One 10-m.g.d. unit drawing suction from the old Dalecarlia plant clearwell should not be dismantled.

(*f*) Two low-head pumps are installed at the effluent end of Georgetown Reservoir for emergency operation. Power is provided via an overhead line along the Capital Transit street railway from Georgetown.

(*g*) One additional 25-m.g.d. pump adequate for installation service on the first high system is stored at Dalecarlia but would require motor dryout and maintenance before operation.

(*h*) The nine pumps and switchgear of the present Dalecarlia high service pump station could be dismantled and stored for possible emergency need.

II. EMERGENCY WATER SUPPLY OPERATIONS UNDER NUCLEAR WEAPONS ATTACK

1. Assumptions

(*a*) A pattern of nuclear weapons attack is presently unpredictable; the accuracy of missiles is subject to many variables and placement on any point target may be inaccurate up to 6 or more miles.

(*b*) The degree of saturation of any continental missile attack is limited to worldwide fallout of equal severity to the attacked and attacker, hence, for weapons economy, a wide variety of tonnage from small to large, depending on objectives, might be anticipated.

(*c*) Contamination of air, land, and human environment will be such that the contamination of the water supply may be relatively insignificant during the period immediately following any disasterous attack.

(*d*) The period of advance warning of attack is unpredictable.

(*e*) Short of the complete destriction in the blast area, varying degrees of surface and underground shelter offer hopes of survival.

(*f*) That varying degrees of evacuation before or following an attack will be carried out.

(*g*) That facilities for automatic closure of valves are required to preserve potable water in covered storage.

(*h*) That interconnection of area distribution facilities is desirable.

2. Facilities considered dependable in an emergency

(*a*) Surviving portions of the covered storage in the District of Columbia, amounting to 160 million gallons in total, will be available for potable use.

(*b*) Surviving portions of covered storage in the Washington Suburban Sanitary District, amounting to 80 million gallons in total, will be available for potable use.

(*c*) Available covered storage in Virginia is presently about 17 million gallons.

(*d*) Interconnections with the WSSD exist and can be increased along the periphery of the District of Columbia so that gravity supplies in limited amounts of potable water can be furnished to survival areas.

(*e*) Independent power supply sources, fixed and portable, are available in the area sufficient for limited water-pumping purposes.

(*f*) Portable water-treatment units are in the area and should be available for emergency use. (Erdlators)

(*g*) Numerous wells exist in the metropolitan area from which limited supplies of potable water could be obtained from extended periods. Some pump maintenance will be required to sustain standby service.

(*h*) Distribution of potable water by trucks from supply centers will be required.

(*i*) Water requirements following any such emergency will be only a small fraction of the system capability under preattack conditions.

3. Consideration for future design of facilities

Due to the uncertainties and unknown variables involved with possible future attack by nuclear weapons, the application of funds to unusual features of design of water-works facilities is not considered warranted. Insofar as this pertains to major storage reservoirs, it should be observed that open storage, whether at a distance or close to the attack area, is subject to contamination from fallout on a continental or worldwide basis as much as from a local blast. Selection of any particular water-supply facility as a specific target for nuclear attack is presently subject to the inaccuracies inherent in missile guidance and

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a direct hit on a vulnerable control structure has a low order of probability when consideration is given to other strategic target areas to be served by those water supply facilities.

III. RESTORATION OF WATER SUPPLY SYSTEM SERVICE AFTER ATTACK

1. The Washington Aqueduct has in the past cooperated with the District of Columbia Civil Defense Agency and the Public Health Service in the preparation of plans and practice of alerts for civil defense and mobilization of facilities, respectively, to evacuate the operating facilities and restoration of water-supply services after a hostile attack.

2. Direct liaison is maintained between the Water Division of the Department of Sanitary Engineering, District of Columbia, and the Washington Aqueduct.

3. In the event of attack, restoration of water supply and sewerage services in Washington are objectives secondary only to saving of life, hospitalization of injured, and feeding of the people. In 1951 the District of Columbia Civil Defense organization and the Department of Public Health set up a plan for organizing all Washington and metropolitan area contractors, construction equipment, and labor pools for reentering the city after an attack to clear debris and to restore water and sewer services and streets and roadways for transportation services. Fire fighting and police activities were integrated with the plan. Due to the lack of top level decision concerning attack by modern weapons, an active civil-defense plan has not been maintained.

4. In case of maximum blast within the primary target area of downtown Washington, the destruction of housing, hotels, office and commercial buildings, underground and overhead utilities would be so extensive that reuse of the area would be delayed probably for months or longer. Service to the remaining populace would be reduced considerably insofar as water supply is concerned and restricted to household use. Fires probably would have to be controlled by backfiring, demolition, or chemicals. It is conceivable that the heavily populated area would be burned out. The water distribution mains would be emptied probably within a few hours and sewage would flood the streets with runoff over the riverbanks. Sanitary conditions probably would be at the worst throughought the lower areas of the city and the discharge from the Washington Suburban Sanitary District could flow into the failed system. It is presumed that the protection of reentering inhabitants, against almost impossible sanitary conditions, would be about as dangerous as the hazards of radiation activity. Any reentry into the city within several days of the attack is not contemplated. Perhaps, 10 or more days would ensue before work forces could enter. It might be months before any usable service could be restored.

5. The restoration of water service might be dependent upon mutual aid supplied by the FCDA and other water utilities in adjoining States or large cities not under attack for the furnishing of labor, materials, and equipment to accomplish the tasks. The mutual aid might have to come from cities and organizations remote from Washington. A single city or Government agency could not justify procurement and remote storage of materials to restore utility services under such devastating conditions as could be effected by modern weapons.

6. In case the water system operating personnel are killed outright in an attack, or fail to return following evacuation, resort would be made in the waterworks industry for engineering staff and labor to restore services.

Members of the AWWA number 11,650. There are 28 sections of this organization in the United States and 2 in Canada. The Chesapeake section in this area covers Maryland, Delaware, and the District of Columbia and has a membership of about 200. Included in the nationwide membership are all classes of engineers, consultants, manufacturers, plant operators, construction experts, chemists, bacteriologists, etc. From that reservoir, assistance could be obtained for restoration.

The waterworks industry is the largest in the world with respect to weight of production. About 17,000 public water-supply systems provide about 11 million people with water. Production averages about 17,000 million gallons daily which is about 18 times the weight of the United States production of steel, coal, petroleum, and agricultural products. Nearly all the plants carry materials, equipment, chemicals, etc., that are surplus to everyday needs. From these nationwide stores would come the suppliers to restore services.

7. The restoration of water service in any stricken city would seem to be dependent for the most part on assistance provided from external sources. The city would have to draw on stocks available from everywhere in much the same manner as provisions are made to restore utilities after flood or cyclone devastation. In the case of destruction from modern nuclear weapons, the results would be more extensive probably and the time for reentry would be greater. In most all events, except for meager emergency water supply, electrical energy, transportation service, and subsistence would all be urgently required for the surviving population.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D. C., January 31, 1958.

Mr. FREDERICK GUTHEIM,
Staff Director, Joint Committee on Washington Metropolitan Problems, Washington, D. C.

DEAR MR. GUTHEIM: Your letter of December 20 requests information concerning alternate sources or methods of water supply for the District of Columbia area. Data on the possible effects of modern warfare on water supply for the area are also requested.

As you know, water supply for the metropolitan area of Washington is derived from several sources, but there are only two important systems. These are: the system of the city of Washington, from the Potomac River, and that of the Washington Suburban Sanitary District from the Patuxent River. There is provision for some exchange of water between systems but the dominant reliance is upon the Potomac River system. This suggests the desirability of alternate sources of supply.

Ground water is found in some abundance in the coastal plain area generally east and southeast of Washington. This occurrence is reported in Bulletin No. 15 of the Maryland Department of Geology, Mines, and Water Resources, Southern Maryland Water Resources, by E. G. Otton. This report is the result of cooperative studies with the Department of the Interior, through the Geological Survey.

It is my understanding that the Corps of Engineers is currently requesting the Geological Survey to make a more detailed study of the ground water potential of that area. This, to the end that potential alternate sources of supply will be fully explored.

This Department, through the Office of Saline Water, is carrying out a program having as its primary objective the development of economical methods of producing fresh water from sea and other saline waters. A number of phenomena and processes are being developed, and the field of promising methods has been narrowed to five general groups. Of those, distillation and processes utilizing membranes may have application in the treatment of polluted waters, including radioactive pollution. Both processes are expensive at present and it is doubtful if distillation of large quantities of water containing normally encountered low concentration of pollution would be advantageous over other processes in the future except under emergency conditions. However, further developments in membrane processes, particularly electrodialysis and related ion exchange techniques may be adaptable to solving some pollution problems. Extensive study of those possibilities has not been made under the saline water conversion program.

Under the Saline Water Act, cooperation with the Atomic Energy Commission and Civil Defense Administration in saline water conversion research is effected. The development of small portable evaporation units, including those for individual household use has been considered. The Hickman type rotary vapor compression still being developed under the program may be particularly adaptable for that use. Dr. Kenneth Hickman has recently built a small household still which is portable and can be operated with a portable electric generating set. It is not yet in production.

It is our understanding that conventional water-treatment techniques supplemented by ion exchange also remove ardioactive contamination from water supplies. Those methods have been under study by the Public Health Service and by the Army Engineer Research and Development Laboratories, Fort Belvoir.

There are many detailed data available to support the broader answers which we are providing in this letter. If you desire further information or elaboration on any of the points we will be happy to furnish it.

Sincerely yours,

FRED G. AANDAHL,
Secretary of the Interior.

Mr. GUTHEIM. Mr. Frank, who is a committee consultant, has a statement that he would also like to make apropos of some of the earlier comments that have been made today.

Representative HYDE. Mr. Frank.

STATEMENT OF BERNARD FRANK, CONSULTANT

Mr. FRANK. I am Bernard Frank. I am a consultant to the committee.

I would like to refer to this statement, that of the Coordinating Committee on the Potomac River Valley, that was presented by Mr. Brown.

There is one particular statement in there that apparently had reference to my report on conservation and recreation, which needs a little clarification, and I will just quote that particular paragraph, referring to that question:

There is one particular point in the report by Mr. Frank that we do not subscribe to. That is that land be bought on both sides of the river presumably for its entire length, in order to have it if and when some hypothetical dam should have to be built in a water-supply crisis.

It is true that this point is not too clear in Mr. Frank's report, and, therefore, we cannot meet it in any direct way. But we should like to record our opposition to any such move.

Now I will read very briefly the paragraph on page 11 to which this comment refers. Previous to reading that paragraph, I discussed a certain number of major deficiencies, beginning on page 10, and then I will read this paragraph as follows:

Pending further study and final decision on this issue—

that is the issue of River Bend Dam, among other things——

Representative HYDE. Excuse me right there. What deficiencies are you referring to?

Mr. FRANK. Deficiencies in existing plans and programs for comprehensive work on the river.

Representative HYDE. With respect to water supply?

Mr. FRANK. Yes, with respect to water supply, watershed management, soil conservation, recreation, and so forth. I didn't deal, of course, specifically with water supply and pollution, because they were outside of my province.

Pending further study and final decision on this issue, early steps might well be taken to acquire the riparian lands along both sides of the Potomac from Great Falls upstream.

Acquisition would make available for public use badly needed river frontage that otherwise would be subject to high-density developments. Such developments would not only deny recreational access to the river, but impair the National Capital's water supply.

That is the sentence or the paragraph that was referred to. Well, in the context I could see where they might get this reaction, that I was referring to the possibility of a dam being built and so forth.

Actually, I had other things in mind, and I would like to refer in that connection back to 2 items, 2 places in my report:

One, on page 3 where I referred to a study undertaken by the Recreation and Wild Life Committee of the Interstate Commission on the Potomac River Basin, the committee of which I happen to be chairman, a study which resulted in a report in 1957 entitled, "Potomac Play Lands."

Now in that report, we pointed out the need for riverfront lands. Actually, the work on this report was done over a period of several years. We pointed out the lack of river frontage for recreational purposes for public access, and mentioned, as I indicated in my report on page 7, and I will read:

> However, public park and recreational facilities for day use and short-term use are notoriously deficient within 50 miles of the Nation's Capital. This applies both above and below Washington on the Potomac and adjacent Chesapeake Bay area.

So the background for my statement on page 11 is not necessarily related to the question of whether or not River Bend Dam or other dams should be built.

It is related to the question of meeting our recreational deficiencies along the river.

I don't know that any further explanation is needed on my part, except this. I also happen to be a strong advocate of flood prevention in the sense of getting out of the way of a river which has a habit of asserting itself every now and then, no matter what we seem to do. And the acquisition of such lands for recreational purposes, by precluding the development of intensive residential communities, and so forth, along the flood plain, would eliminate the possibility of loss of life and property.

Now, those of us that have hiked up and down the river know that every now and then I hike along the river and I look up about 20 or 30 feet and I see leaves and debris.

Even in minor floods, the water will rise and stages will rise 10, 15, or 20 feet.

The Potomac has a record going way, way back to the early 18th century at least, of now and then having some serious floods.

So that is another aspect. It is a way of achieving zoning, not in the negative sense where you just say you can't use the land for residential development, but in a positive sense by putting the land to some type of use that will benefit the public, and that when floods occur, will be subject to very minor, relatively speaking, minor and temporary damage.

Those are the things behind my statement on page 11, Mr. Chairman.

Representative HYDE. You want to point out that it has no particular relation to River Bend?

Mr. FRANK. No, sir.

Representative HYDE. Don't you suppose that they are concerned about the extent of your recommendations?

Mr. FRANK. I would like to say that my statement could have been clearer with regard to the upstream extent of the proposed acquisition.

It was open ended. I said upstream from Great Falls, and they interpret it to mean, "presumably for its entire length."

I can well understand their making such a statement. Now when one takes the background of this statement, my statement into account, one will realize that I should have said from Brunswick down, because that was the area, between Brunswick on the upper part and Westmoreland State Park in Virginia on the lower part, that was the area to which the earlier report Potomac Play Lands and a report even preceding that entitled "Forests and Parks in the Potomac Basin" referred.

So actually, I was talking about an area from roughly Brunswick, Md., on down rather than clear up the Potomac River to where it begins.

Representative HYDE. I can understand the misgivings that these people have.

Mr. FRANK. Yes, sir.

Representative HYDE. I even understand it more clearly because I am simply trying to get the C. & O. Canal area established as a National Park, which includes the acquisition of a little bit of additional land along the whole 168-mile length, and that has even aroused quite a bit of screaming in certain areas because of the additional acquisition of land which they say is being taken away from the people.

Of course, the opponents of that don't explain how they are going to make it all available to the public and yet take 70 percent of it for private use as they suggest.

But, nevertheless, I think it is well that you have made it clear as to just what you want by that, so that we will have it to refer to in case we get any more protests or expressions of disagreement with you about it.

Thank you, Mr. Frank.

Is there any question you want to ask Mr. Frank?

Mr. GUTHEIM. I think not, Mr. Chairman, but at this point in the record I will insert a document from the National Capital Planning Commission and National Capital Regional Planning Council entitled "Policies for a Regional Land Use Plan for the National Capital Region, by John T. Howard, Consultant," with particular attention to section 2, part 1, entitled "Water Supply and Sewage Disposal," which recommends preservation of the site of the River Bend Dam from that point of view. This document was earlier cited by Mr. Paul Watt.

Representative HYDE. It will be received in the record at this point.

(The document referred to is as follows:)

NATIONAL CAPITAL PLANNING COMMISSION, NATIONAL CAPITAL REGIONAL PLANNING COUCIL, WASHINGTON, D. C.

POLICIES FOR A REGIONAL LAND USE PLAN FOR THE NATIONAL CAPITAL REGION

By John T. Howard, consultant, November 5, 1956

This statement sets forth briefly the policies accepted as guides for the preparation of a regional plan for the National Capital region covering the elements of land use, population distribution, and employment distribution. The policies are grouped under four headings:

I. Growth Factors
II. Regional Factors Influencing Development
III. Development Objectives
IV. Design Policies

I. GROWTH FACTORS

1. *Total population*

The single variable that will most significantly influence the plan is the total population to be planned for. This, in turn, will be principally controlled by the trends of economic opportunity which will retain the natural increases of population within the region and draw migrant population to it. The study of trends of economic activity (prepared by the Council for Economic and Industry Research) sets the range of the probable future population of the region. This study, applying analysis of demographic factors to the prospects for employment, suggests the upper and lower limits as follows:

(1955: 1,860,000)
1965: 2,135,000–2,857,000
1980: 2,546,000–4,788,000

The purely economic and demographic analysis suggests as the most probable a 1965 figure of 2,500,000, and a 1980 figure of 3,400,000. These figures, however, are the product of a deliberate policy on the part of the economic analysts of overestimation. The trends of economic activity, and therefore the population, are themselves to some degree subject to influence of planning decisions on development policy. For a number of reasons, it is believed that figures lower than these would be more desirable as plan targets.

These reasons include the objective of maintaining the National Capital region as primarily the seat of government of the United States, and therefore discouraging such a measure of development not directly related to Government as would conflict with the efficient functioning of Federal activities. Related to this is the objective of maintaining and enhancing the physical appearance of the National Capital region, and especially its core, to preserve the dignity and beauty essential to the seat of government as a national symbol. A third reason is the well-being of the population itself; it must be recognized that, in the present state of technology and planning, a growth of metropoiltan population even to the region's present figure creates more and more serious problems of traffic congestion, of water supply and sewage disposal, of securing well-rounded residential communities in a reasonable relationship to workplaces, and of avoiding a loss of required open space. It seems wise to accept as plan bases figures for future population as low as can be reconciled with the natural trends and the healthful growth of the economy of the region.

The following figures have been accepted as the basis for the land use and population distribution plan. Recognizing that it is futile and misleading to pretend to an impossible degree of accuracy, the proposed populations are presented as ranges:

1965: 2,300,000–2,500,000
1980: 2,800,000–3,200,000

2. *Total employment*

Estimates of total employment and of the breakdown by major category have been developed consonant with these population figures, based in part upon the economic analysis. The numbers estimated to be employed in different categories, however, have also been influenced by the policy stated above and by the studies of availability of land in various parts of the region suitable for the different kind of land uses related to employment categories.

The following figures for regional employment have been used in preparing the general development plan. Like the population figures, they are expressed in ranges (although for purposes of calculation it has been necessary to adopt a single figure somewhere near the center of each range, this central figure is not to be considered any more "probable" than any other figure within the range):

	1955	1965	1980
Federal Government	312,000	320,000 to 350,000	330,000 to 400,000.
Commercial employment	312,000	370,000 to 410,000	430,000 to 530,000.
Industrial employment	95,000	120,000 to 140,000	150,000 to 210,000.
Other employment	97,000	105,000 to 115,000	125,000 to 150,000.
Total	816,000	930,000 to 1,000,000	1,080,000 to 1,260,000.

II. REGIONAL FACTORS INFLUENCING DEVELOPMENT

1. Water supply and sewage disposal

The Potomac River is the principal source of the region's water supply. Engineering studies have been made for further exploiting this source, to meet future expanding needs; one of the possibilities is a need to build a major dam above Great Falls, which would flood a substantial area upstream. Since the period of study and the funds allotted to this plan preparation did not include engineering studies for water supply, the prudent policy to follow is to design a plan which will not preclude the building of such a dam if it is later determined to be the best way to meet the needs of the region. Under this policy, the dam itself is not a proposal of this plan; but the preservation of the site of the dam and its lake is proposed in order to assure future flexibility of decision.

As a corollary policy, to protect the purity of the Potomac supply, development should be so designed as to prevent discharge of effluent from sewage-treatment plants either into the river or into tributaries which flow into it between Little Falls and several miles upstream of Great Falls. There are also other drainage areas serving as the watersheds for sources of water supply, which must be similarly protected. This does not completely preclude development within these watersheds; it does, however, limit it either to densities low enough to make possible individual sewage treatment without treatment-plan effluents flowing into any stream in polluting quantities, or to development close enough to the watershed line to make feasible pumping sewage or effluent into a drainage area not involved in water supply.

The Potomac below Little Falls, the lower Patuxent, and a number of other streams, although not water-supply sources, are nevertheless present or potential recreational and fishlife resources and as such should be protected from or relieved of pollution. The obvious planning policy is to so coordinate urban development and sewerage systems as to make feasible the discharge of effluent at a degree of treatment and dilution that will hold pollution at levels consistent with recreational use.

2. Airport requirements

In addition to the present National Airport, there are two other major airports or airport sites which may be required to serve the region in the future—the Burke site, and Andrews Field. The Civil Aeronautics Authority has made studies of both sites, showing reasonable runway layouts for major airport use. Applying the recommendations of the President's Airport Commission (1952) to both sites, the approach areas can be identified from which urban development should be excluded to assure maximum safety and eliminate friction between the airport and its neighbors. As with the Potomac Dam, neither of these airports are specific proposals of this plan; but the preservation of their sites and the protection of their approach areas is proposed in order to assure future flexibility of decision.

3. Soil conditions

More intensive planning studies of some parts of the region made in the recent past have identified large areas where the soil conditions are adverse to urban development. It is an obvious policy to avoid planning for urban use of these areas.

4. Defense considerations

It is official Federal policy "to encourage and, when appropriate, to require that new facilities and major expansions of existing facilities important to national security be located, insofar as practicable, so as to reduce the risk of damage in the event of attack." In applying this policy to a regional plan for the National Capital, the problem is to define "practicable"; recent decisions on the location or relocation of a number of Federal agencies in the region suggest that it means "convenient" or "economical." As a guide to the location of additional Federal employment in the more distant future, the policy is accepted as requiring locations for limited concentrations of Federal employment in addition to those already decided upon to be beyond a 20-mile radius from the center of the region. For this and other planning reasons concentration should rarely exceed 5,000 employees.

III. DEVELOPMENT OBJECTIVES

1. Provision for the seat of government

One of the prime objectives of a plan for the National Capital region must be to provide the physical framework for the efficient and economical conduct of the work of the Government. This means continuing as heretofore to plan sites for the location of facilities which need to be at the center of activity in the District of Columbia as well as sites for establishments which can more readily be accommodated at new employment places away from the center. Also, both a floor and a ceiling for Federal employment in the central area now seems desirable in the interest of maintaining the economic stability of the central area as well as avoiding the overcrowding of that area. In all these respects the Planning Commission's conclusions on the location of Federal employees reached in 1950 remain valid except that some greater radial dispersion now seems necessary.

2. Provision for population

Also obliquely referred to was the objective of providing a good environment for the population: healthful, convenient, and pleasant residential areas, conveniently linked to employment and recreation, and equipped with local and regional service facilities for shopping, education, and culture.

3. Provision for employment

The third major objective is to provide sites for the economic activities which support population, primarily commerce and industry. As has been noted, private employment is expected to rise from about 60 percent of the total to about 70 percent of the total.

4. Provision for accessibility

A secondary objective, essential to the achievement of the first three, is to provide a maximum of accessibility between all the parts of the region for which a close relationship is necessary. One phase of this objective is to locate such related land uses as near to each other as possible; the other phase is to provide means of circulation of maximum speed and capacity. A desirable criterion for these objectives is a journey to work of not much more than half an hour; another is the time-distance of less than half an hour between those key Federal agencies having close functional relationship.

5. Provision for open space

Another secondary objective keyed to the first three is the reservation of open space for public use, and in addition the preservation of an open character of development throughout extensive parts of the region. The purpose is not merely recreation, though this by itself would be enough in view of the increasingly urban character of our population and the prospective increases in leisure time and standard of living; another important purpose is the preservation of flexibility in many kinds of future developmental decision, by making sure that the empty land is not all at the outer edge of a tightly built-up circle many miles on radius. A third is the saving of irreplaceable resources of scenic or historic value, and of valuable resources of agricultural activity. Yet a fourth is the separation of clusters of development for each other, in such a way as to encourage the evolution of social relationships in communities of small enough scale to function as democratic entities.

IV. DESIGN POLICIES

1. Residential land use and population distribution

The 2 target dates of the plan, 1965 and 1980, invite 2 different policies toward design of location, character, and density of residential uses. For 1965, most of the significant decisions that will influence the course of development have already been made: Around the fringes of the presently built-up area, highways have been built or are being built to bring vacant lands within reach of employment centers, and water and sewer lines have been built or are being built to make such lands developable; subdivisions have been approved, acreage has been acquired by developers; zoning has been adopted to permit urban or suburban types of densities. The plan for residential land use and population distribution for 1965 is largely a prediction, based in the main upon the familiarity of the planners of each local jurisdiction with what is currently happen-

ing, and modifying the observable trends only where it seems practical to hope for effectuation. Accordingly, the 1965 plan shows almost all of the additional residential development occurring as an accretion to the present sprawl of suburban growth, with some additional to outer-lying existing centers where it seems likely to happen, and a significant amount of scatter of population into rural areas on large lots as has been the trend.

The 1980 situation, however, is far enough in the future to be able to hope for the influence of a regional plan to take effect. Even so, a further suburban accretion is expected, but split by wedges of open spaces reaching into the present edge of development. Outer concentrations of population are proposed, separated by belts of open space or rural-density development from the continuous sprawl. In general, the sectors of further growth follow main corridors of radial travel. Urban and suburban types of residential land use are proposed to be kept clear of the areas reserved under the regional factors policies: Possible airports and their approach areas, the possible dam and lake, and the poor soil conditions; and also kept clear of areas proposed to be reserved for regional recreation and for industry and commerce. Densities are proposed in various ranges, although the plan is expressed in terms of gross densities and is not set up as a guide to specific zoning; it is hoped that there will be substantial variations in zoning density within each community area, so that each may include a variety of housing types and of residential character ranging from urban to rural.

The policy to protect the Potomac and other watersheds from major urban development imposes sharp limits upon the extent to which it is possible to propose new concentrations of residential land use and of population in the outer reaches of the region. This is another strong reason for holding to a lower rather than a higher future population for the region; under the water-supply and sewage-treatment technology now foreseeable, a much larger population and higher densities in certain instances than is proposed cannot be provided for within this region without violating a number of the important policies and objectives set forth above.

The proposed distribution of regional population has been worked out by concurrent and interacting land use and statistical analyses. The following figures show the ranges which the land-use plan represents; the center of the range has been used in further statistical caculations, but is not considered any more probable than other points in each range.

	1955	1965	1980
National Capital region	1,860,000	2,300,000 to 2,500,000	2,800,000 to 3,200,000.
District of Columbia	850,000	880,000 to 920,000	900,000 to 1,000,000.
Montgomery County	255,000	360,000 to 420,000	500,000 to 620,000.
Prince George's County	290,000	410,000 to 480,000	530,000 to 650,000.
Alexandria	85,000	105,000 to 115,000	110,000 to 130,000.
Arlington	155,000	190,000 to 210,000	200,000 to 210,000.
Fairfax County and Falls Church	165,000	260,000 to 300,000	410,000 to 520,000.
Loudon County	23,000	25,000 to 27,000	30,000 to 42,000.
Prince William County	37,000	43,000 to 47,000	50,000 to 80,000.

2. Federal centers and Federal employment

As the key element in both land use and employment, the location of future additions and shifts of Federal employment have been subject as far as possible to the objective set forth above under "Provision for the Seat of Government" and the policy under "Defense Considerations." It is recognized that the great bulk of Federal employment has been progressively fixed at specific locations within the central area of the District according to plans maintained by the National Capital Planning Commission for 30 years. However, it is important to note that the greatly expanded public buildings program approved by the last Congress commits most of the balance of the proposed sites for the central area except for East Capitol Street. Therefore, outside the District other sites and distributions of Federal employment are proposed on suitable land in considered relationship to future new concentrations of population of which these Federal sites would be the focus and reason for being.

3. Industrial and commercial land use, and employment distribution

As with residential land use, the 1965 plan for industrial and commercial land use, and correspondingly the allocation of 1965 employment, is considered to be largely a prediction, based upon what is now happening and on the judgments of the planners of the different local jurisdictions. New locations for industry are limited by already dense development within the District of Columbia, and in the outer areas by well established zoning policies and the physical character of available land; determination of probable locations within these limits is influenced largely by railroad and prospective highway patterns. Increases in commercial land use and employment tend to be even more firmly fixed by present zoning and highway policy.

For 1980, development of industrial land is expected to go farther out, as a continuation of present trends for highway orientation and low density; the labor force will also be moving outward. Opportunities are nevertheless limited by suitable land areas.

The 1980 development of commercial centers is also expected to follow the spreading population, and is proposed to be concentrated at points of maximum accessibility on the circulation network. The obviously great increase in commercial activity in suburban areas, however, is not proposed to be at the expense of the central business district. Economic activity and employment are expected to increase there also, as a consequence of the centripetal forces of the total regional population increase, and facilitated by the improved accessibility that is planned to result from the transportation proposals of this survey. Some such increase is healthy, and inevitable, if transportation improvements can be brought into being; the limits which are foreseen are those necessary to protect the core of the seat of government both as to efficiency of governmental function and as to amenity and dignity.

The following table, again expressed in ranges to avoid a false sense of precision, shows the allocation of total employment within the region:

	1955	1965	1980
National Capital region	816,000	930,000 to 1,000,000	1,080,000 to 1,260,000.
District of Columbia	503,000	510,000 to 530,000	550,000 to 610,000.
Montgomery County	66,850	95,000 to 105,000	120,000 to 160,000.
Prince Georges County	61,450	90,000 to 110,000	120,000 to 160,000.
Alexandria	28,350	30,000 to 40,000	40,000 to 50,000.
Arlington	97,900	100,000 to 110,000	100,000 to 110,000.
Fairfax County and Falls Church	35,700	65,000 to 85,000	100,000 to 130,000.
Loudoun County	7,700	9,000 to 11,000	10,000 to 16,000.
Prince William County	15,050	16,000 to 20,000	22,000 to 28,000.

4. Recreation and open spaces

In keeping with the objectives outlined, the land use plan proposes the preservation of major open spaces for recreational or other reserved uses in all locations where natural conditions invite their consideration. Some of these are proposed for consideration as regional park areas, to be kept in their natural state; this includes an extension of previous official proposals for stream-valley park reservations, and also a number of wooded and scenic sites. The total area proposed is not out of line with current "acres-per-thousand-population" standards for such reservations, if the standard is applied to that ultimate population which may be reached many decades from now, if and when water-supply and sewage-treatment technology make it possible and national population pressures make it necessary to accommodate 4 million people or so within this region. It is clearly wise planning policy to set aside now enough natural land to meet any such contingency, because if it is not set aside it can never be recovered—and surplus land can always be released.

Even these areas, however, do not provide enough open space in the right places to provide for that insulation between communities and that assurance of future developmental flexibility which planning principles require. The land use plan shows additional "green wedges" and "green belts" which are proposed not for public use or for nonuse, but for continued rural use. This is a feature of the plan that can be made effective only by a coordinated official policy involving zoning restrictions plus the withholding of utilities and accessibility.

5. Circulation

Circulation proposals, though not submitted as a design scheme at this time, exert major influences upon land use and upon the distribution of population and employment. The policies and proposals here set forth not only require the support of a circulation system based upon them, but also are based in part upon certain hypotheses as to the configuration of a circulation system which are apparent upon review of the maps describing the land use plan. Alternate proposals for the form and nature of such a system are in preparation for later review.

Representative HYDE. I understand we have one more witness, Mr. Kilgore.

Mr. Kilgore, will you give us your full name and the organization you represent?

STATEMENT OF BRUCE M. KILGORE, EDITOR, NATIONAL PARKS MAGAZINE

Mr. KILGORE. My name is Bruce M. Kilgore, and I am editor of the National Parks magazine for the National Parks Association.

The Parks Association is very appreciative of this opportunity to present our views on the Potomac water problems.

I have a written statement by our executive secretary, Fred M. Packard, which I would like to submit for the record, but I will not take the committee's time to read this in full at the present time.

Representative HYDE. It will be received in the record following your remarks.

Mr. KILGORE. I would, however, like to present the four main points of policy statement recently adopted by the association in regard to the problems under discussion here today.

Our first point is that pollution which now contaminates the Potomac River and its estuary can and must be completely cleaned up.

Point No. 2. The water supply problems of the metropolitan area can and must be solved by drawing on the estuary, which is fresh water, during rare periods of low flow; on the underground reservoirs of the coastal plain; and after desaltation on the lower Potomac, the Chesapeake Bay, and the ocean.

Point No. 3: We are firmly opposed to the construction of any storage reservoirs anywhere on the Potomac or its tributaries or headwaters. Such reservoirs will destroy invaluable farm, timber, recreation and wilderness country. They are unnecessary because the downstream solutions are available.

Point No. 4: We call for a greatly enlarged system of national outdoor recreation areas, including the proposed Chesapeake & Ohio Canal National Historical Park, and the enlargement of the national and State parks and forests by further public acquisition.

Representative HYDE. Right there I hope your association plans to testify for that Chesapeake & Ohio park in the hearings to be held.

Mr. KILGORE. We certainly will, sir.

From our vantage point, the important thing seems to be to solve the problem in terms of pollution abatement and the utilization of the estuary, the underground reservoir of the coastal plain and after the desaltation of the Potomac, Chesapeake Bay, and ocean for water supply.

These are available. It is imperative that every effort be made to utilize them. We feel the alternative proposals involving dams on the Potomac or its tributaries are unnecessary because these downstream solutions are available.

We thank you for this invitation to express our views, Mr. Chairman.

Representative HYDE. Thank you, Mr. Kilgore.

(The statement referred to is as follows:)

Mr. Chairman, I am Bruce M. Kilgore, editor of National Parks magazine. The National Parks Association appreciates this opportunity to present our views on Potomac River water problems of importance to the District of Columbia metropolitan area.

I have a written statement by our executive secretary, Mr. Fred M. Packard, which I should like to submit for the record, but I will not take the committee's time to read it in full. I would, however, like to present the four main points of the policy statement recently adopted by the association in regard to the problems under discussion here today.

(Prepared statement of Fred M. Packard is as follows:)

Point No. 1: The pollution which now contaminates the Potomac River and its estuary can and must be completely cleaned up.

Point No. 2: The water supply problems of the metropolitan area can and must be solved by drawing on the estuary, which is fresh water, during rare periods of low flow; on the underground reservoirs of the coastal plain; and after desaltation on the lower Potomac, the Chesapeake Bay, and ocean.

Point No. 3: We are firmly opposed to the construction of any storage reservoirs anywhere on the Potomac or its tributaries or headwaters. Such reservoirs will destroy invaluable farm, timber, recreation and wilderness country. They are unecessary because the downstream solutions are available.

Point No. 4: We call for a greatly enlarged system of national outdoor recreation areas, including the proposed Chesapeake & Ohio Canal National Historical Park, and the enlargement of the national and State parks and forests by further public acquisition.

Mr. Chairman, from our vantage point, the important thing seems to be to solve the problem in terms of pollution abatement and the utilization of the estuary, the underground reservoirs of the coastal plain, and after desaltation of the lower Potomac, the Chesapeake Bay, and the ocean for water supply. These seaboard water supplies are available. It is imperative that every effort be made to utilize them. We feel the alternative proposals involving dams on the Potomac or its tributaries are unnecessary because these downstream solutions are available.

We thank you for your invitation to express our views on this important matter.

NATIONAL PARKS ASSOCIATION,
Washington, D. C., April 22, 1958.

Hon. ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems,
Washington, D. C.

DEAR SENATOR BIBLE: The National Parks Association appreciates the invitation to present our views on Potomac River water problems of importance to the District of Columbia metropolitan area.

Our interest in this problem stems from a concern for protection of natural reservations of any type. It is the association's belief that our present system of national and State parks and mouments, wilderness areas, wildlife refuges, and other outdoor recreational areas does not adequately meet the spiritual and physical recreational needs of our expanding population. We are convinced that the problems of water supply from, and pollution treatment of, the Potomac River must be met in such a way as to provide adequate park and recreation opportunity for the masses of people crowded in and around our Nation's Capital.

At the January 23, 1958, meeting of its board of trustees, the position of the National Parks Association with respect to the Potomac River Basin problems was set forth as follows:

"1. The Potomac River Basin is one of the few regions in the East in which a natural outdoor environment for human life may still be preserved and enhanced.

"As major lines of policy for this purpose we declare the position of the National Parks Association as follows:

"(*a*) The pollution which now contaminates the Potomac River and its tributaries can and must be completely celaned up.

"(*b*) The water supply problems of the metropolitan area can and must be solved by drawing on the estuary, which is fresh water, during rare periods of low flow; on the underground reservoirs of the coastal plain; after desaltation on the lower Potomac, the Chesapeake Bay, and the ocean.

"(*c*) We are firmly opposed to the construction of any storage reservoirs anywhere on the Potomac or its tributaries or headwaters; such reservoirs will destroy invaluable farm, timber, recreation and wilderness country; they are unnecessary because the downstream solutions are available.

"(*d*) We call for a greatly enlarged system of national outdoor recreation areas, including the proposed C. & O. Canal National Historical Park, and the enlargement of the National and State parks and forests by further public acquisition.

"(*e*) No arterial roads should be constructed in any of the units of the National Capital park system.

Thus it is our firm belief that approaches to a complete cleanup of the river and estuary should be fully explored before any dams or reservoirs—whether on the main stem or tributaries of the Potomac—are authorized. We feel that the estuary of the Potomac River, below the falls, is an inexhaustible source of potable water for the city if pollution can be eliminated. The estuary is fresh water as far down as Fort Washington, and contains an immense volume of water.

The estuary must be cleaned up anyway. There are many fine communities along the estuary facing an intolerable pollution situation. If the pollution were eliminated, Washington could draw on the estuary, and it would not be necessary to construct a dam which would submerge the old C. & O. Canal and many other valuable recreational and historical resources.

It seems essential that sewage from Washington be given the fullest possible treatment. This is the minimum that any modern American city should do. As the December 1957 report by the University of Maryland Bureau of Business and Economic Research points out:

"It should be clear by now that no amount of flushing will provide a safe or satisfactory answer to the contamination problem. The proposal to use a charge of water to move the waste farther down the river at a faster rate provides an excellent example of the limited viewpoint which would attempt to alleviate problems in one part of the basin by floating them downstream to plague other communities. The only satisfactory answer to the sewage problem is to construct treatment plants which will prevent the untreated sewage from entering the river. Until this is achieved, construction of the proposed high dam can only result in the creation of a contaminated 36,000-acre lake.

"There is no safe, hygienic method of dealing with sewage once it is in the river, and any method or proposal which attempts to compromise with the provision of adequate treatment plants can only be a stopgap."

If we completely clean up the river, the available supply of pure fresh water from the estuary alone has been calculated as 52 billion gallons. This would seem more than adequate to meet any demands for more water during periods of low flow along the Potomac.

From our vantage point, the important thing seems to be to solve the problem in terms of pollution abatement and the utilization of the estuary, the underground reservoirs of the coastal plain, and after desaltation of the lower Potomac, the Chesapeake Bay and the ocean for water supply. These seaboard water supplies are available. It is imperative that every effort be made to utilize them.

One other alternative to River Bend Dam would be dams on upstream tributaries. This too is undesirable from the viewpoint of those interested in national and State parks and wilderness and persons concerned with timber and agricultural resources, for tributary dams would mean destruction of these kinds of resources. Such alternative proposals are unnecessary because the downstream solutions are available.

The protection of the natural environment which the Potomac Valley provides for human life is greatly dependent on the restoration of the timber and agricultural resources. The close relationship between such protection and water supply is set forth in the committee's metropolitan water problems staff report by Bernard Frank, Assistant Director, Division of Watershed Management Research, United States Forest Service, in these words:

"The ability of the river and its watershed lands to meet Metropolitan Washington's needs for clean, safe, and well-regulated water—as well as for recreational use—depends * * * upon how its forest, crop, and pasture lands, which make up the great bulk of its 9.3 million acres, are protected, managed, and utilized. This task cannot be accomplished exclusively—or even primarily—by engineering works. The condition and use of these lands directly and indirectly affect the character and distribution of the Potomac's flows down to Washington and below."

Likewise Mr. Frank has indicated the economic as well as esthetic values offered by providing more park lands in the metropolitan area. He notes that:

"Literally millions of dollars can be saved the taxpayers of the metropolitan area by building conservation practices into developments at the time they are planned. In addition, the extent to which ample open space (woods, grasslands) is preserved in parks, natural areas, golf courses, etc., will have a strong bearing on both silt pollution and storm runoff, on the pressures for recreational use in and beyond the metropolitan region, and even on the water supply and sewage pollution problems. Stream valley parks, flood plain zoning and building limitations, and the location of additional parks on critical watershed slopes would all contribute materially to a cleaner and more useful Potomac."

The Potomac River, as yet relatively untouched by the worst forms of industrialization, can still be a region in which people can live and work close to nature, and in which they can easily reach out to excellent outdoor recreation. We of the National Parks Association urge the committee to carefully consider these values in working to solve the water supply and pollution problems of the Potomac River as they affect the Washington metropolitan region.

Sincerely yours,

FRED M. PACKARD, *Executive Secretary.*

There being no further witnesses, the committee will stand adjourned until 9:30 o'clock Friday morning.

(Whereupon, at 4:20 p. m., the committee adjourned until 9:30 a. m., on April 25, 1958.)

WASHINGTON METROPOLITAN AREA WATER PROBLEMS

FRIDAY, APRIL 25, 1958

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON WASHINGTON
METROPOLITAN PROBLEMS,
Washington, D. C.

The joint committee met, pursuant to recess, at 10 a. m., in room P-38, United States Capitol Building, Washington, Senator Alan Bible (chairman) presiding.

Present: Senators Bible and Beall, and Representative Hyde (vice chairman).

Also present: Frederick Gutheim, staff director; Betty Kraus, secretary; and Gilbert V. Levin, special consultant.

Senator BIBLE. The meeting will come to order.

I believe our first witness this morning is Dr. Geyer.

Dr. Geyer, may we hear from you?

Mr. GUTHEIM. Mr. Chairman, may I at this point insert in the record the several statements that have been filed with the committee?

Senator BIBLE. The letters will be so inserted.

(The several letters the committee has referred to are as follows:)

EXHIBIT A

NATIONAL CAPITAL PLANNING COMMISSION,
August 11, 1955.

STATEMENTS ON NEED FOR PLANS TO PROTECT WASHINGTON WATER SUPPLY AGAINST DISCHARGE OF SEWAGE INTO POTOMAC RIVER

Attached for your information is a letter from Lt. Gen. S. D. Sturgis, Jr., Chief of Engineers, United States Army, stating the position of the Corps of Engineers with regard to the discharge of sewage into the Potomac River upstream of water-supply intakes. The statement was requested by the National Capital Planning Commission for the purpose of guiding the Commission, the Regional Planning Council, and other governmental agencies concerned with the location of outlying Federal establishments in the Washington metropolitan area.

While the letter points up several specific situations which are currently being studied by the Commission and the Regional Planning Council, it lays great emphasis on the need for the development of comprehensive plans for the disposal of sewage outside of the drainage area of the Potomac River from Little Falls to several miles above Great Falls.

Bearing on this same problem, the Commission and Council have already approved the enclosed outline of regional planning principles to be applied in evaluating the relative merits of sites for the AEC headquarters building. Your attention is directed specifically to the third principle bearing on the relationship of location to regional water-supply and sewage-disposal policies.

The Commission and the Council would welcome any comments, suggestions, or recommendations which you may care to submit in respect to the enclosed statements, especially those which would implement the Chief of Engineers' request.

HARLAND BARTHOLOMEW, *Chairman.*

APPENDIX, AUGUST 3–4, 1955, MEETING

DEPARTMENT OF THE ARMY,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., July 27, 1955.

Mr. HARLAND BARTHOLOMEW,
Chairman, National Capital Planning Commission,
United States Department of the Interior,
Washington, D. C.

DEAR MR. BARTHOLOMEW: The district engineer of my Washington district has informed me that your Commission desires a statement of the position of the Corps of Engineers with regard to the discharge of sewage into the Potomac River upstream of water supply intakes.

Governmental laws and historical documents have committed the Department of the Army to provide an unfailing and abundant supply of good and wholesome water to the seat of the Government. As a consequence, upon due consideration, the Potomac River was selected as a source of water supply.

As you may be aware, the District of Columbia water system is under the joint control of the Department of the Army and the District of Columbia. The Department of the Army, through my Office, has jurisdiction over the system's water supply division including dams, conduits, reservoirs, filtration plants, and a part of the pumping system. The distribution division of the system is under the jurisdiction of the District of Columbia. Plans for expanding the system to serve through the year 2,000 have been developed.

Presently, the District of Columbia water system furnishes water to Washington, D. C., Arlington County, and Falls Church, Va., and many Federal establishments located in the States of Virginia and Maryland. Also, there are interconnections between the District of Columbia water system and that of the Washington Suburban Sanitary Commission for the purpose of supplying water to Maryland communities when the Washington Suburban Sanitary Commission water system is deficient in supply. Further, the system is connected remotely to the city of Alexandria, Va., and to the Virginia Water Co. systems through Arlington County and Falls Church mains.

In view of the foregoing the district engineer has objected in writing, to the Virginia State Water Control Board, to the discharge of effluent from sewage treatment plants into the Potomac River or into small tributary streams which, in turn, discharge into the reach of the Potomac River extending between Little Falls and a locality several miles upstream of Great Falls. Also, the Commissioners of the District of Columbia objected to the discharge of sewage into that area of the Potomac River, but the Virginia Water Control Board ruled in opposition to the objections and approved plans for the discharge of the effluent into Scott Run of a sewage-treatment plant serving a residential development in McLean Heights, Va. However, the Virginia Water Control Board expressed the view that possible future expansion of this Virginia area will necessitate probably that the McLean Heights and possibly other discharges be disposed of outside the watershed of the Potomac River which lies above the new District of Columbia water supply intake now under construction.

I have been informed that the Central Intelligence Agency is considering the construction of an office building together with sewage disposal works near Langley, Va., and that treated sewage will be discharged into the Potomac River. My most recent information is that the raw sewage will be pumped to a Fairfax County treatment plant to be located on Pimmit Run where it will receive treatment. The plant effluent then will be discharged into Pimmit Run which empties into the Potomac River at Chain Bridge. Discharge at this point will not affect the District of Columbia water supply. It is understood that the water supply for this Agency will be furnished from Falls Church, Va., mains which are supplied by Washington aqueduct.

Mr. John Nolen, Jr., your Director of Planning, has furnished information that consideration is being given to the building of a Government installation on the Maryland side of the river upstream of Cabin John Creek. The Atomic Energy Commission is studying a location on a tributary stream which empties into the

Potomac River above Great Falls. Both installations will be outside the service limitations of the Washington Suburban Sanitary Commission's collecting systems or interceptors. No information is available relative to the disposal of sanitary and other wastes which will be generated at these latter installations and attendant housing developments which are bound to follow. In addition to the foregoing, it is known that there are several housing developments in the planning stage at this time which are concerned with the disposal of sanitary wastes. The discharge of sewage from any of these facilities and developments into the Potomac River above Little Falls is objectionable and should not be permitted.

The construction of new governmental establishments, outside the limitations of Washington, D. C., and Arlington County, Va., creates a need for vicinity housing and developments, shopping centers, and commercial interests to accommodate the employed personnel. Such situations are now developing rapidly throughout the metropolitan areas of both Virginia and Maryland. Those entrusted with planning for governmental offices and housing developments and industrial interests are in a position, in advance of construction, to adopt and utilize measures that will protect and maintain the water quality of the Potomac River which is the only dependable source of water supply for the entire metropolitan area. It, therefore, is desirable that comprehensive plans be developed for the disposal of sewage outside the drainage area of the Potomac River from Little Falls to several miles above Great Falls.

In line with the elimination of pollution in the Potomac River in the metropolitan area, the Interstate Commission on the Potomac River Basin, in its Report on Water Pollution in the Washington Metropolitan Area, dated February 1954, has set forth certain water quality objectives and criteria. I consider that attainment of these objectives and compliance with the criteria outlined for the section of the Potomac River between Great Falls and Little Falls, when met, will insure a raw-water quality suitable as a source for municipal and Federal water supply and other desirable uses.

In view of the foregoing, it is requested that your Commission take such action in your planning as will discourage and preclude the discharge of sewage into the Potomac River upstream of the water supply intakes serving the National Capital, and that the various communities involved be encouraged to develop and activate a comprehensive master plan for sewerage and sewage disposal whereby sewage effluent will be discharged downstream of the water supply intakes.

Sincerely yours,

S. D. STURGIS, Jr.,
Lieutenant General, United States of America,
Chief of Engineers.

AUGUST 4, 1955.

NATIONAL CAPITAL PLANNING COMMISSION, NATIONAL CAPITAL REGIONAL PLANNING COUNCIL

Outline of regional planning principles to be applied in evaluating the relative merits of sites for AEC Headquarters Building, supplementing agency requirements and criteria

1. COMPREHENSIVE PLAN RELATIONSHIPS

(*a*) Consistency of the proposed location with the policies relating to proposed Federal establishments in the National Capital region as set forth in the comprehensive plan for the Nation's Capital and its environs.

(*b*) Adaptability of the proposed location with the official master plans for the local jurisdictions.

2. COMMUNITY FACILITIES

(*a*) Location should be in the vicinity of a nucleus or potential nucleus for a suburban community where public facilities and services are readily available or obtainable, such as schools, commercial establishments, housing, etc.

(*b*) Location should have available local access capable of providing an increase in traffic volume of 700 vehicles during peak hours.

3. RELATIONSHIP TO REGIONAL WATER SUPPLY AND SEWAGE DISPOSAL POLICIES

The location should be such as to permit the disposal of sewage from the Federal installation, and from potential private development resulting from that installation, into such water-courses and to such a degree of treatment and dilution as not to affect adversely any existing or proposed source of water supply or to degrade the water quality standards recommended by public authorities. Bilateral agreements, designed to safeguard water supplies and to secure equitable use of supply sources, should be entered into by both Federal and State authorities having control, or desiring to establish the required control, before commitments are made as to any location.

4. PLANNING CONTROLS

Local subdivision and zoning regulations should be adequate to properly guide the likely new private development resulting from any Federal employment center as well as protect the already established land uses.

EXHIBIT B

FEDERATION OF CITIZENS ASSOCIATIONS
OF THE DISTRICT OF COLUMBIA,
April 22, 1958.

Senator ALAN BIBLE,
Chairman, Committee on the District of Columbia,
United States Senate, Washington, D. C.

DEAR SENATOR BIBLE: At its meeting on April 10, 1958, the Federation of Citizens Associations voted to endorse the request for $500,000 for fiscal 1959, rather than the $200,000 now in the budget, for the survey of the Potomac being undertaken by the United States Army Corps of Engineers.

Very sincerely yours,

MABEL E. MORRIS,
Mrs. EDWARD B. MORRIS,
Secretary.

P. S.: Enclosed are copies of two resolutions which were endorsed unanimously at that same meeting.

RESOLUTION—POLLUTION OF THE POTOMAC RIVER

Whereas the recreational needs of the city of Washington, D. C., are constantly increasing and additional recreational developments are being restricted due to the pollution of the Potomac River and its tributaries; and

Whereas any further delays in initiating pollution control and abatement measures will greatly increase the cost of such projects and further impair recreational use; and

Whereas the Tidal Basin, with its Cherry Blossom Festivals, served by an inlet from the River is a disgrace in the eyes of every visitor to the Nation's Capital; and

Whereas the river is not a fit place on which to hold the President's Cup Regatta or other such events due to gross pollution of the river: Now, therefore, be it

Resolved,

1. That the Federation of Citizens Associations of the District of Columbia, in a regular meeting on April 10, 1958, requests the District Commissioners to speed up their present program for control of sewage and silt pollution of the Potomac River and its tributaries so as to provide clean water for safe recreational use and water sports within the metropolitan area of Washington, D. C.; and

2. That the Federation of Citizens Associations support the proposed amendment to the Federal Water Pollution Control Act (H. R. 11714) which will provide additional funds and allow municipalities to work jointly for the control and abatement of sewage pollution in the Potomac River; be it further

Resolved, That copies of this resolution be sent to the Fairfax County Board of Supervisors; District Committee of the United States Senate; District Committee of the House of Representatives; House Public Works Committee; Joint Congressional Committee on Washington Metropolitan Problems; Washington

Metropolitan Regional Conference; Colonel Welling, Engineer Commissioner of the District of Columbia; Mr. David V. Auld, Director, Department of Sanitary Engineering, District of Columbia; and Interstate Commission on the Potomac River Basin.

RESOLUTION—PIMMIT RUN POLLUTION

Whereas the Nation's Capital City is located on the Potomac River and so situated as to be desirable for water sports and other recreational purposes; and

Whereas the Potomac River is receiving such amounts of sewage wastes as to cause it to be unsafe and unhealthy for shoreline and water sports recreational activities; and

Whereas the mushroomlike growth of the Pimmit Run area of Fairfax County which is being accelerated by the relocation of the Central Intelligence Agency headquarters will further increase the discharge of sewage and sewage effluent into Pimmit Run, which enters the river at a point where it is now reasonably clean; and

Whereas it is acceptable to the District of Columbia Commissioners to pipe all sewage originating in the Pimmit Run area through a trunkline sewer across Chain Bridge and into the District of Columbia system for treatment at the Blue Plains plant: Now, therefore, be it

Resolved, That the Federation of Citizens Associations of the District of Columbia, assembled in regular meeting on April 10, 1958, urgently requests the Fairfax County Board of Supervisors to carry out this project to prevent further pollution of the Potomac River from Pimmit Run flows; be it further

Resolved, That copies of this resolution be sent to the Fairfax County Board of Supervisors; District Committee of the United States Senate; District Committee of the House of Representatives; House Public Works Committee; Joint Congressional Committee on Washington Metropolitan Problems; Washington Metropolitan Regional Conference; Colonel Welling, Engineer Commissioner of the District of Columbia; Mr. David V. Auld, Director, Department of Sanitary Engineering, District of Columbia; and Interstate Commission on the Potomac River Basin.

EXHIBIT C

LEAGUE OF WOMEN VOTERS OF THE DISTRICT OF COLUMBIA,
Washington, D. C., April 9, 1958.

Senator ALAN BIBLE,
Chairman, Joint Committee on Washington Metropolitan Problems,
Senate Office Building, Washington, D. C.

DEAR SENATOR BIBLE: We understand that the Joint Committee on Washington Metropolitan Problems is holding hearings on Tuesday, May 22. Because the convention of the National League of Women Voters is being held in Atlantic City, beginning May 21, we will be unable to testify personally. We therefore request that the enclosed statement be made a part of the record of these hearings.

Sincerely yours,

(Signed) Libby Dunn,
(Typed) Mrs. MILTON DUNN, *President.*

STATEMENT OF THE LEAGUE OF WOMEN VOTERS OF THE DISTRICT OF COLUMBIA FOR THE JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS

The questions which the Joint Committee on Washington Metropolitan Problems is studying are of great concern to the League of Women Voters of the District of Columbia. We are planning to go into a number of them in some detail later in the year and therefore hope that we will be permitted to file a statement in the future with regard to them. We feel that we cannot properly assess the suggestions made by Mr. Frank and Mr. Levin in the short time we have been given.

There is one matter, however, on which we do feel able to express the views of our membership. For many years we have been studying the relationship of the Federal Government to the District of Columbia. As citizens of Washington we are acutely aware of our unique status. While Washington is the seat of the Federal Government and the pattern of its development is a result of

Federal activities, the Federal Government does not accept its responsibilities with regard to the area over which it exerts such great control.

The Board of Engineers' recommendations to the Department of Sanitary Engineering is a case in point. The League of Women Voters has reviewed these recommendations and sees the need for such a costly program. Because Washington is the Nation's Capital, countrywide recognition has been given to the pollution of the Potomac River as it flows through the heart of the Federal area of the city. The river must be an example for the rest of the country; it should have higher standards than those prevailing elsewhere. The city itself cannot meet the pressing demands on its resources in all areas and still meet these standards because of the dire financial straits in which it finds itself—not at leasst before the time limit set for compliance by the United States Public Health Service.

The League of Women Voters of the District of Columbia urges this committee to assess the responsibility of the Federal Government to the District of Columbia; to determine whether the District should be a second-class city or truly the Nation's Capital; and whether Washington should be able to point with pride to its municipal services as well as to its monuments.

EXHIBIT D

WEST MONTGOMERY COUNTY CITIZENS ASSOCIATION,
April 23, 1958.

CHAIRMAN, JOINT COMMITTEE ON WASHINGTON METROPOLITAN PROBLEMS,
Washington, D. C.

DEAR SIR: The West Montgomery County Citizens Association has followed with interest the staff reports of your committee on water supply and sewage disposal and water pollution in the Washington metropolitan area.

We are particularly interested in the prospect of a dam at River Bend which would cause such a heavy impact on our immediate area and enclose herewith a copy of a letter from our association to the district engineer, Corps of Engineers, United States Army, which summarizes the general concern of our group. In order that this concern not be lost sight of, we respectfully request that the enclosed letter be made a part of the minutes of the current public hearings.

Very truly yours,

WILBUR R. GARRETT, Jr.,
President.

ROCKVILLE MD.

EXHIBIT E

WEST MONTGOMERY COUNTY CITIZENS ASSOCIATION,
May 9, 1957.

DISTRICT ENGINEER,
Corps of Engineers, United States Army,
Washington, D. C.

DEAR SIR: The West Montgomery County Citizens Association, an organization with a membership of 200 persons residing in an area in the vicinity of Potomac, Md., at their regular meeting of May 6, 1957, discussed the "Survey of Potomac River and Tributaries, * * *" prepared by the United States district engineer, Washington, D. C., in 1944, and presented to Congress in 1946 (H. Doc. No. 622, 79th Cong., 2d sess.). Two representatives of your office were present at the meeting and were most helpful in answering technical questions regarding this plan which members of the association raised.

We considered in particular the effect which the proposed dam at River Bend would have on our immediate area, and the membership by unanimous vote authorized me to forward to you the following summary of our feelings on this plan which we hope you will take into consideration during your current restudy of the plan for development of the Potomac Valley.

We recognize that the Washington metropolitan area has a growing need for water to take care of the needs of its expanding population and to assist in pollution abatement of the Potomac during dry seasons of the year, and we appreciate the fact that storage reservoirs in the Potomac or its tributaries may be required to fulfill these needs.

We recognize that dam suitably placed would assist in flood control. We note from the 1946 report (table 33) that according to that plan the storage capacity of the River Bend Dam was primarily intended for hydroelectric power production (1,100,000 acre-feet), and only secondarily for flood-control purposes (400,000 acre-feet).

We recognize that the area might benefit from the availability of a large freshwater lake, but believe the drawdown of the pool level during the summer months (normal 10 feet, maximum 25 feet (table 42)) would greatly decrease the value of the reservoir for recreational purposes and would certainly make many parts of the shoreline unattractive for residents in the vicinity.

The conclusion of the 1946 report was that dams for flood control alone were not economically feasible, but that multipurpose dams for flood control, pollution abatement, recreation, and hydroelectric power production would be. It is difficult for us to believe that the production of hydroelectric power can really be more important to the future of this area than water storage for consumption and pollution abatement, particularly in view of the population growth that has occurred since 1946 and that projected for the next 25 years. We wonder if an economic study under today's conditions will not lead to a somewhat different evaluation of the relative benefits of these functions.

The area which would be condemned for the storage reservoir created by the River Bend Dam, to an elevation of 247 feet, includes a significant portion of one of the only two areas of Montgomery County zoned for a minimum of 2 acres for residential construction. The character of this community is now established as a very desirable residential area, and a great many homes have been built here since 1946. Not only would the creation of this large reservoir flood out a number of these homes, but it would result in a change in the character of the whole area which would be bound to affect all the residents whether or not their properties were condemned. Naturally we who live in this area would view with great regret any project which would so greatly alter the character of the community in which we reside. We have successfully resisted all attempts to change the zoning restrictions in effect which insure the continued development of this area in conformity with its present character.

It is our understanding that this whole Potomac Valley development is currently being restudied in order to bring the estimates contained in the 1946 report up to date. We want to urge most strongly that in making the current study the present character of this area which would be most directly affected by a reservoir at River Bend be considered, not only insofar as it would affect land-acquisition costs but as it would affect all the residents who have selected this area for their homes because of its present character. We therefore urge most strongly that the possibility be reconsidered of locating such dams as may be required for water conservation and flood control further upriver (perhaps with a dam just below the mouth of the Monocacy River in addition to some of those proposed in the 1946 report) in areas which have not as yet become established residential communities. We further urge, since it appears from the 1946 report that the chief purpose of the River Bend Dam was for hydroelectric power, that careful consideration be given to the present economics of developing a series of dams for water conservation and flood control alone, in view of the values which might reasonably be assigned to those features of the plan with the increased development of the whole area and its present and projected population.

We shall look forward to studying the results of your current survey, and request that we be given an opportunity to comment on your proposals before they are presented to Congress.

W. R. GARRETT, Jr., *President.*

ROCKVILLE, MD.

EXHIBIT F

APRIL 21, 1958.

Senator ALAN A. BIBLE,
Chairman, Senate District Committee and the Joint Congressional Committee on Washington Metropolitan Problems, Washington, D. C.

DEAR SIR: With supplementary reference to letter of March 11, 1958, the following suggestion is submitted for committee consideration.

Further study of water pollution and water supply suggests esplanade-flood wall-roadway plan as practical, with addition of a second conduit or reservoir; instead of the single suggested conduit under the roadway (E). See illustration.

Section (A) to be used as a sewage system. Section (B) a reservoir, with control valves, (D) for stream flooding to retain water in section (B). Section (B) would be closed at both ends to induce sedimentation in section (B). Section (C) may be used as a filtrating transmission plant.

Using simple figures on section (B), a 10-mile structure, 20 by 20 feet, would produce a reservoir of approximately 158 million gallons of reserved water. Such structures on both sides of the stream would produce reservoirs of double the amount. Increasing the dimensions would naturally increase the reservoir capacity.

Both sides of the stream is practical; as reserved water is expended on one side, tapping into the other side continues water supply, affording cleanup of sedimentation of the other side.

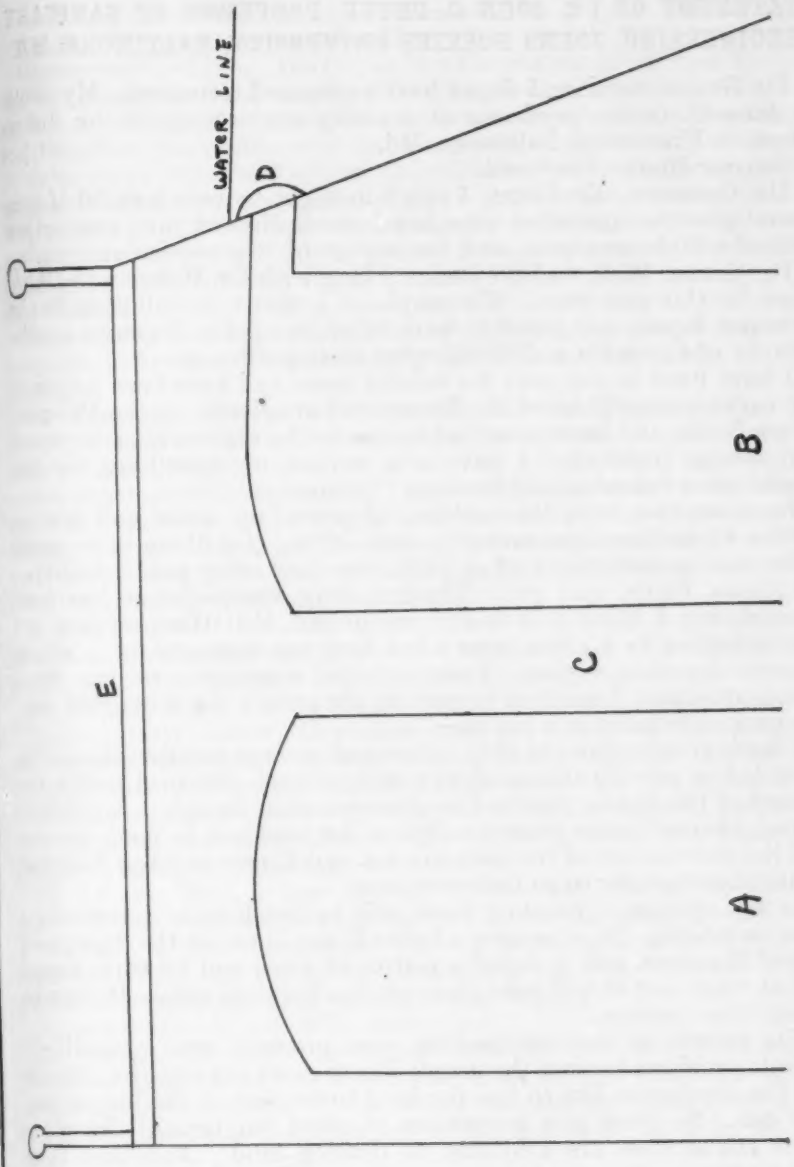
Such project may always be increased in length or width whenever demands dictate. Such project would not flood any lands and would afford the metropolitan area convenient and practical service.

The service practicability and problem momentousness should warrant overlooking esthetic considerations.

Sincerely,

GEORGE J. VRAZSITY.

WASHINGTON, D. C.


WATER LINE
D
B
C
E
A

STATEMENT OF DR. JOHN C. GEYER, PROFESSOR OF SANITARY ENGINEERING, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD.

Dr. GEYER. Senator, I do not have a prepared statement. My name is John C. Geyer, professor of sanitary engineering at the Johns Hopkins University, Baltimore, Md.

Senator BIBLE. Very well.

Mr. GUTHEIM. Dr. Geyer, I think it might be very helpful if you would give the committee some brief description of your association with the Wolman report, and the studies of this particular area.

Dr. GEYER. Well, we have been working with Dr. Wolman in Baltimore for this past year. We completed a report on pollution in the Potomac River, and possible ways to clean up the Potomac in the District of Columbia and Washington metropolitan area.

I have lived in this area for twenty years and have been active in the various committees of the Interstate Commission on the Potomac River Basin, and know many of the men who are working on water and sewage problems. I have also worked up something for the Washington Suburban and Sanitary Commission.

In connection with the problem of providing water and sewage service to metropolitan areas, it seems to me that there is no great difference in these types of utilities than any other public utility—telephone, lights, and gas. Through long experience it has been learned, and I think it is widely recognized, that these services are best provided to a given area when they are managed by a single concern for that region. Transportation companies or gas companies are given franchises to provide the service for areas that constitute a metropolis or a region.

I have always thought that water and sewage services should be provided in exactly the same way and perhaps provided under the control of the Public Service Commissions, even though it is publicly owned, because under those conditions the rates can be made proper and the distribution of the costs are not so different as when different political entities try to go their own way.

In my opinion, ultimately there will be much more integration; it is inevitable. It is coming about all the time on the Maryland side of the river, and it is just a matter of when and by what means and at what cost it will take place on the Virginia side. It may be a long time coming.

The growth of the metropolitan area presents some exceedingly difficult problems because the people like to move out into the suburbs and the developers like to buy the land to develop at the lowest cost they can. So there is a temptation to move out beyond the place where the services are available, to develop land. And then they have no way to dispose of the sewage because the whole area has not developed to the point where it is possible yet to build trunk sewage out to some of these localities, and they must be served by local plants.

The history has been that as the density of population increases and financial resources become available, then these local plants are abandoned and the whole system integrated. This has been going on in Maryland where a great many of the little sewer treatment plants started around by the Washington Suburban and Sanitary District had been abandoned and plans are now being made for abandonment in other areas.

Representative HYDE. Mr. Chairman——

Senator BIBLE. Representative Hyde.

Representative HYDE. Dr. Geyer, is what you say about such facilities being provided and managed by a single concern even more true as far as efficiency of operation and economy to the community and benefit to the residents of the community is concerned? I mean in those areas which are subject to multiple-State jurisdiction, such as the Washington metropolitan area. Isn't what you say about service being provided best when managed by a single concern even more true where you have a metropolitan area spread out into a number of different State jurisdictions? Hasn't that been true in other areas?

Dr. GEYER. Yes, the multiplicity of jurisdictions complicates the problem and makes it exceedingly difficult to meet some of the problems.

For example, take the water problem for the Virginia side. If the population of this whole area grows to between 4 million and 5 million in the next 50 years, as it has been predicted, it is going to take a tremendous investment for big trunk mains to carry the water through that area, and no single local jurisdiction has the money to handle that sort of thing. The size of it, the magnitude of the works that would have to be built, certainly point toward integration and everybody getting together to do the job.

Representative HYDE. Dr. Geyer, have you made any extended studies on this matter of the regional treatment of water and sewer problems in river basins which encompass several State jurisdictions?

Dr. GEYER. I don't know that I exactly understand your question.

Representative HYDE. Has there been any study of this question of regional treatment, regional management, regional regulation, regional operation of the water and sewer problems. By water, that includes everything connected with water, such as supply, pollution and conservation, things of that sort. Have you had any extensive studies on that particular subject?

Dr. GEYER. Well, I have worked in this field for a good many years. I was consultant to several of the drainage basin committees of the old National Resources Planning Board, and as I say, I have been active in the Interstate Commission on the Potomac River Basin. It depends on what you define as a "region."

Representative HYDE. Well, watershed.

Dr. GEYER. The entire watershed—take the Potomac for example. There has been no such coordination of the type of which you speak except in certain areas. TVA is the outstanding example of river basin planning and coordination of all activities in a basin, but other than that I don't know.

Representative HYDE. Well, would you say that your studies indicate that regional treatment is the best approach, if I make myself clear about what I mean?

Dr. GEYER. Regional treatment of sewer or regional treatment of the whole problem?

Representative HYDE. The whole problem.

Dr. GEYER. Oh, by all means.

Representative HYDE. Thank you.

Senator BIBLE. Did you want to elaborate further on your opening statement?

Dr. GEYER. No, I think not, Senator.

Senator BIBLE. You would prefer to be subjected to questions?

Dr. GEYER. Yes, sir.

Senator BIBLE. Well, we will allow the questions to proceed. Mr. Levin?

Mr. LEVIN. Dr. Geyer, from your experience in this area, do you think that consolidation of the many individual sewage treatment plants in the northern Virginia region of the Washington metropolitan area—that is consolidation to some degree—and not necessarily to a single plant, would work to public health and/or economic advantage at this time?

Dr. GEYER. I think such consolidation is inevitable, but I don't know enough about the situation to say specifically that certain plants ought to be consolidated right at this time. It is bound to come sooner or later.

Mr. LEVIN. You feel that planning for this is necessary?

Dr. GEYER. Oh, by all means, everything should take this into account. Planning should be based on recognition of the fact that some day these plants will have to be abandoned and the area treated as a unit.

Mr. LEVIN. What would you say about the relative effect of the discharge of sewage at 1 or 2 points downstream from a metropolitan area, service discharge of the same quantity of sewage, as contrasted with 20 or 30 individual points further upstream?

Dr. GEYER. Well, the whole principle of sewage treatment is that you collect your problem at one point where you can handle it effectively. And if you don't handle it effectively, you might have one trouble spot instead of many trouble spots.

The cost of sewage treatment, like the cost of every other big operation, declines as the quantity handled increased. So it is much more efficient economically to have a few plants than to have many small ones. You get a much higher quality, and technical control over the operation, if you have a few large plants, than if you were to have many scattered small ones.

Mr. LEVIN. Do you believe that the capacity of the Potomac River to assimilate sewage satisfactorily is established at this time?

Dr. GEYER. Well, this involves the discussion concerning the 120,000 pounds biochemical oxygen demand, a simulative capacity that is now the figure most commonly stated as used. I think this figure is all right for the type of material that is going into the river now, and the type of situation that exists now. But when all the sewage is highly treated there will be much larger amounts of mineralized phosphorus and nitrogen in the river, and there will be much less turbidity. Then there is going to be a profound change in the biological behavior of the Potomac. Whether this will be to the detriment of the river or not, nobody knows. So I think we say 120,000 pounds of biochemical oxygen demand, that applies to the situation as of today, as it exists today. But it may not be the important factor when the situation changes in the future.

Mr. LEVIN. Relative to this future problem, do you believe that the ultimate disposal of sewage effluent from the Washington metropolitan area poses a problem? Will we have to resort to some other means of disposal of the effluent than is now practiced?

Dr. GEYER. In our report for the Interstate Commission on the Potomac River Basin, we recommended that the sewage ultimately be carried over to the Chesapeake Bay where there is ample volume of water for dispersing it, and the reason for doing that was that we just simply could not convince ourselves that it was possible in any way to predict what would happen in the Potomac when the treated sewage of 3 million to 5 million people is discharged into it. There will be very little flow. All the flow that will occur in the Potomac will be what is released from some reservoir up stream, because in the dry seasons of the year, the community will be using more water than now flows into the Potomac. The Potomac would be dry at Great Falls unless water is stored and released for low streamflow maintenance.

Mr. LEVIN. Would you have any opinion as to whether future treatment would permit some of the sewage effluent discharged in this area possibly to be used as irrigation water?

Dr. GEYER. Completely treated sewage would be an ideal water for use in supplemental irrigation of farm crops because it does contain some mineral fertilizers, nitrates, a little phosphorus and potash, and the plants living in soil would use that.

Mr. LEVIN. In the Wolman report, it was stated that should River Bend Dam be built, and I believe the report concluded that it would be built, that allowance should be made in capacity of the reservoir for siltation, in order to remove the silt load carried by the Potomac before it is deposited in the Washington metropolitan area.

Would you explain that?

Dr. GEYER. The estuaries along the Chesapeake, and particularly the Potomac estuary and its branches, are filling with silt at an alarming rate. If anyone wishes to see the ultimate results of this kind of thing, they can go down to Port Tobacco and see the docks there with the river not in sight. The river now is somewhere out across the mud flats. And that, without dredging, would be the situation that would ultimately exist in Washington.

This silt is going to keep coming down the river and it is a question of where you want to permit it to settle, and where you want to put it, if you decide to remove it from the places it has settled. At the present rate it is settling in the District of Columbia, and being dredged out and being disposed of now in some small shallow areas of the Potomac—but it is still within the District. If this large reservoir is built, it would hold the silt for many, many years in the future.

Now all reservoirs collect silt. The smaller ones fill quickly. The little Washington's Suburban Sanitary District reservoir at Burnt Mills was full within 10 years, but it was a tiny reservoir.

The River Bend project is so large there will be many, many years before siltation would be serious in that reservoir and by the time it became serious, certainly other reservoirs will have been built and they will be holding back some of it and we all hope that, of course, modification in farm practices, modification in construction practices, may reduce the silt.

Mr. LEVIN. You think that these modifications of farm and conservation practices by themselves could be relied upon to reduce the silt load in the river and to increase the flow in the river to the point where the dam and reservoir would not be necessary?

Dr. GEYER. Conservation practices on farmlands will cut down soil erosion, and cut it down spectacularly in some cases, but the soil erosion from the farms is only a part of the problem with regard to silt.

Silt comes from river bank and gullies and roadside ditches and everything else—the mountain sides are washing down. It is hard to believe that soil-erosion control could reduce the amount of silt by more than 50 percent, let us say.

Now as far as the water is concerned, the more water is held back and put in the ground the more it becomes available for evaporative transportation by the plants. So, actually, conserving water in the ground on the farms is very good for the farmer, but you lose more of it back to the atmosphere and naturally get less down the stream very likely.

Mr. LEVIN. Thank you. I have no further questions.

Senator BIBLE. Mr. Gutheim?

Mr. GUTHEIM. Dr. Geyer, may I ask if you have had an opportunity to look at one of the committee's working papers prepared by Bernard Frank entitled "Metropolitan Water Problems," which deals very largely with conversation and recreation?

Dr. GEYER. No, I have not.

Mr. GUTHEIM. Mr. Frank is concerned largely with questions of watershed management. Based on the experience of experimental watershed management in the South, where the watersheds are much smaller that the total Potomac Basin, but where an improvement in the low flow of the streams by as much as one-third or even one-half has been accomplished by various measures of watershed treatment, he offers the possibility that some significant increase in the flow of the Potomac, regulation of the flow and building up of it, may be accomplished by a better coordinated watershed management.

Now, I want to ask you to comment on this.

Dr. GEYER. I have studied this sort of thing.

Mr. GUTHEIM. Your point about the evaporation was very well illustrated in one of these experimental watersheds where the evaporation in the leaves of trees takes a very great deal of the moisture. By cutting down deciduous trees a very great deal of runoff was achieved.

Dr. GLYER. That is right. The plants use, on something in the order of half the water that falls in the form of rain, and if you eliminate the plants then you eliminate this very tremendous consumption of water. The way to get most water is to do paving. In Bermuda, they have paved the hillsides and catch all the water in a reservoir.

Mr. GUTHEIM. May I return to the question of silt? In your report with Dr. Wolman and to the Interstate Commission of the Potomac River Basin, and I quote:

> The total silt deposited in the Washington Area has not been measured or carefully estimated.

The conditions that you have cited earlier in the Tidewater portions of the coastal plain, are quite different in many respects than those that are found above Great Falls in the Piedmont area. Do we have any way of determining the extent of depositation and silting that originates through these coastal plain conditions as opposed to those which originate further up stream, and hence might be more influenced by watershed management practices?

Dr. GEYER. I don't know the answer to this. The Soil Conservation Service of the Department of Agriculture may have some figures, but I have never seen them. Of course, it is well recognized that the rate of shed erosion and gulley erosion is quite different in the coastal plain as compared with the Piedmont and in the Piedmont as compared with the Appalachian Plateau. The Piedmont is one of the worst areas in the United States.

Mr. GUTHEIM. One final question. I believe that your report had identified the silt problem as the most important source of pollution in the Potomac River. In view of the fact that so little is known about it, do you feel that studies of this sort should have a high priority?

Dr. GEYER. Yes, sir.

Mr. GUTHEIM. In general basin-wide studies?

Dr. GEYER. By all means.

Mr. GUTHEIM. Thank you.

Senator BIBLE. Congressman Hyde?

Representative HYDE. Yes, Mr. Chairman. Dr. Geyer, one of the debates that has been going on, and I started to say raging, but I will not put it quite that strong, has dealt with this matter of health regulation as it relates to the pollution of the Potomac.

At the present time, you of course, are familiar with the fact that such pollution is regulated in the Basin by the Health Departments of Maryland, Virginia, and the District of Columbia, West Virginia, and, of course, to some extent up in Pennsylvania—a five-State region—and the specific proposal has been made that such regulation which involves the setting of standards of contamination and enforcement, that the compliance with those standards be placed in one regional body, a regional organization.

Do you think that would be advisable from your studies of the problem in the river basin, or do you think it can be satisfactorily handled on the present segregated basis?

Dr. GEYER. Well, the States are, of course, very loath to give up their control over these matters, and it involves the policing power, you see, which is the States' prerogative.

Representative HYDE. I am directing my question more to the technical aspects. I recognize very, very clearly the political aspects.

Dr. GEYER. Yes, sir.

Representative HYDE. Being somewhat involved, politically, myself.

Dr. GEYER. Yes, sir.

Representative HYDE. But I recognize it as something to be treated very tenderly; but, from the standpoint of efficiency and for the benefit of the people who live in the area, would you think that it would be advisable to regulate the control in a regional way?

Dr. GEYER. If we could start all over again and assume the hypothetical situation that we have a free choice to do this in any way we wanted to, it would be much better to handle it on a basin-wide—in a basin-wide manner, with some authority that had control of all the water in the basin.

Representative HYDE. Well, do you think that a plan such as has been adopted in the lower Hudson, the tri-State compact up there, and on the Ohio River, on a more modified basis, is good, generally, or an improvement for the river basins involved?

Dr. GEYER. I think both of those, the tri-State compact, and the compact on the Ohio, are doing a reasonably good job; but, of course, it depends on their getting the cooperation of the States and the industries and everyone else involved.

Representative HYDE. And, of course, any plan we adopt depends on how the people involve execute it. There is no magic in the plan.

Dr. GEYER. That is right.

Representative HYDE. You would say that is an advisable approach to consider seriously?

Would you say that those plans adopted elsewhere, namely, those two specific areas, would you suggest that we dismiss them from our minds for the moment so far as this area is concerned?

Dr. GEYER. No; I don't. I think that they have both served a very useful purpose, but I wouldn't possibly say whether they are the best plans that might have been used for these problems; but they were the ones that were practiced and they filled a very great need for developing some mechanism for better cooperation of everyone in the area.

Representative HYDE. Do you think that such a need is indicated in the Potomac River Basin area from your standpoint?

Dr. GEYER. Yes; I think it is to a certain extent. The Interstate Commission on the Potomac River Basin has met that need.

Taking the Interstate Commission on the Potomac River Basin as an example, it provides a function of tremendous value just in bringing all the people from the different States together, giving them an opportunity to become friends with one another, and learn each other's problems and tell each other what they are doing.

This automatically develops a certain amount of understanding and cooperative effort that wouldn't exist if they all stayed at home in their own bailiwicks and wrestled with the problems independently.

Representative HYDE. Well, to put it more specifically, I am trying to find out whether I should continue the efforts I have made in the past to try to enlarge the scope of the Interstate Commission or abandon it.

Heaven knows I have enough to do, and I don't want to waste my time. I am trying to find out from you experts whether or not it is advisable to continue efforts along those lines or to abandon them and let the thing stay like it is at the moment.

Dr. GEYER. I don't think you should abandon your efforts at all.

The Interstate Basin Commission has been relatively ineffective primarily because of lack of financial support, but it should take a very much more active part in all basin, water, and resource activities than has been the case in the past. They have been inclined to put most of their effort into the pollution problem, which is only one of many problems; and, in order to be effective, they need highly qualified technical staffs that can actually function as a planning commission—to study these things in detail and be able to come up with ideas and have the facts to back them up.

They do that in the limited field of pollution, now.

Representative HYDE. I don't want to belabor this too much, but I am really anxious to try to get the right answers to this thing.

The Interstate Commission on the Potomac River Basin, under its present setup, has the authority only to plan and recommend.

Dr. GEYER. That is right.

Representative HYDE. I agree with you that its funds have been too limited and it hasn't had an adequate amount of money to do a good, adequate job of planning; but, specifically, I have been recommending that it go one step further than planning and recommending.

The original resolution of Congress under which the commission was organized gave the consent of Congress to the five jurisdictions to form such a commission for the purpose not only of planning and recommending, but to regulate and control.

Those two words are in the resolution of Congress under which the interstate commission was established.

Now, do you think it would be advisable to go that step further and to amend the compact so that the commission might have the authority to regulate and control as well as to plan and recommend?

That is the specific thing that I am trying to find out, and if it isn't a good idea I want to stop wasting my time; but, if it is, I would like to go forward with it.

Dr. GEYER. This is an exceedingly difficult question to answer, because of the political aspects of it that I don't know much about; but I think in the end a better job would be done if the control were centralized and the whole thing planned and the execution of it was under the direction of some kind of regional group that took into account all the tributaries and the main stream and all the problems into one single picture, and made the decisions.

Representative HYDE. Thank you, Doctor.

Senator BIBLE. Any further questions?

Thank you very much, Dr. Geyer.

Mr. GUTHEIM. Before we have the next witness, may I have the Wolman report inserted in the record at this point?

Senator BIBLE. Yes, the report will be made a part of the record.

(The document referred to is as follows:)

A CLEAN POTOMAC RIVER IN THE WASHINGTON METROPOLITAN AREA

by

ABEL WOLMAN

JOHN C. GEYER

EDWIN E. PYATT

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

203 TRANSPORTATION BUILDING

WASHINGTON 6, D. C.

October 1957

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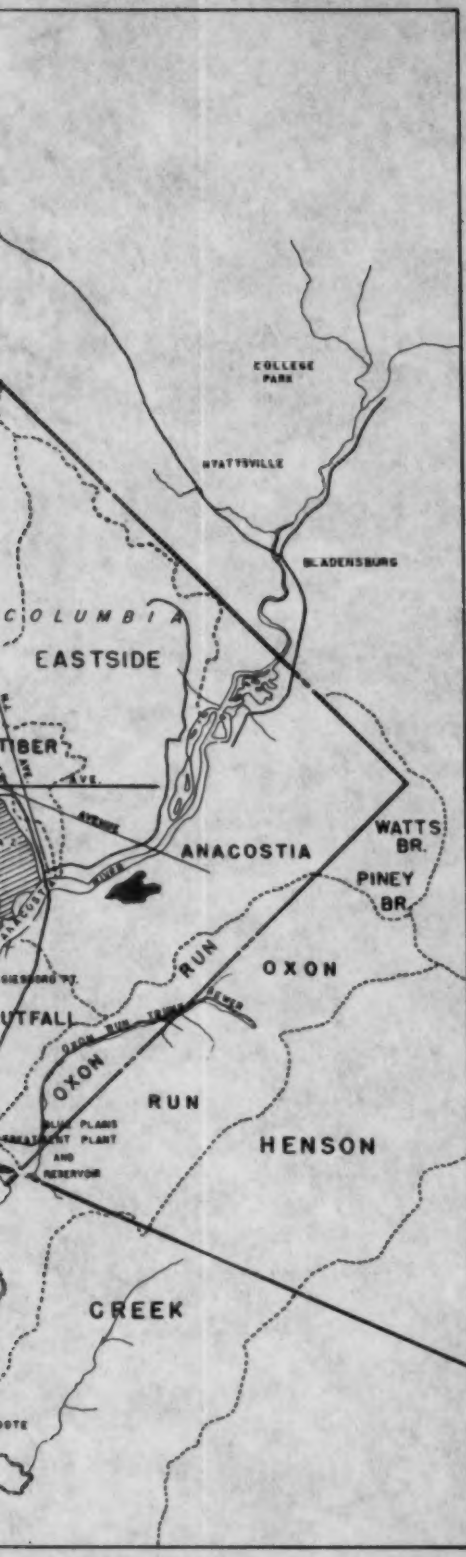
ALEXANDRIA TREATMENT PLANT
POTOMAC
FAIRFAX CO. TREATMENT PLANT
HUNTING CREEK
DOGUE CREEK
LITTLE HUNTING CREEK
FT. FOOTE

Figure 1.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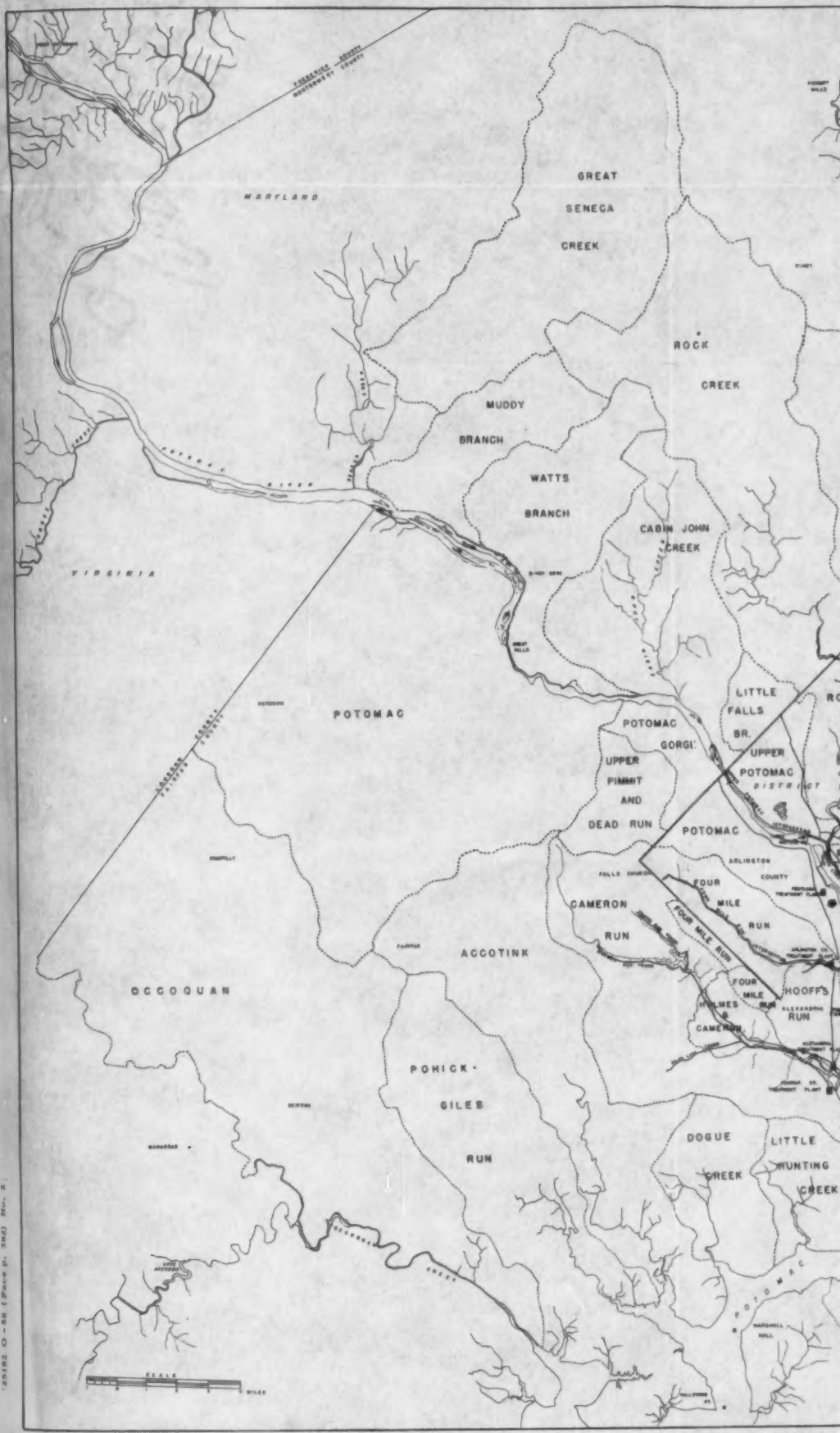


WASHINGTON

(20102 O-58 (Page p. 302) No. 2)

MAP OF
HINGTON METROPOLITAN AREA
FIG. 1

A CLEAN POTOMAC RIVER IN THE WASHINGTON METROPOLITAN AREA

FOREWORD

In the young, vigorous, fast growing and spacious United States, things not wanted have simply been thrown away. The waterways of the country have traditionally been a dumping place for civilization's discards. What could be easier than throwing the offal into the River? The water will hide it and carry it away. Fortunately, this attitude of careless discard is changing rapidly. The individual American is awakening to the condition of his streams as well as to the condition of his parks, sidewalks, streets and his own back yard. The esthetic as well as the sanitary values of a clean environment are more widely appreciated.

It is appropriate, therefore, to take another look at the Potomac River in the Washington Metropolitan Area, for the River is here both the front yard and the back yard of the Nation's Capital.

There are many sources of pollution. All of them must be attacked if the Washington Area is to have a clean Potomac. Each year the River itself brings down and dumps in the area millions of cubic feet of silt. The metropolis adds its partially treated sewage. Storms wash street and yard filth into the River. In those areas where combined sewers remain, untreated domestic sewage is discharged with the storm water overflows. Industries add their liquid waste and every boat of size on the River broadcasts its sewage. Boats, industries, and people still use the River as a dumping place for refuse of every description. The Department of Sanitary Engineering in a recent six months period skimmed off 300,000 pounds of debris that failed to sink.

Past attention to the Potomac pollution has concentrated on problems caused by domestic sewage. Nevertheless, in spite of much effort and great expenditure of money, the sewage pollution has increased from decade to decade. An understanding of why this has happened suggests what may be needed to change the course of events.

The Washington Metropolitan Area is one of the fastest growing communities in the United States. It is having severe growing pains which express themselves in terms of financial burden placed on the existing population in order to provide major facilities for people still to come. There is heavy competition for money among all types of public works: schools, water, streets, parks, sewers and sewage disposal. The rapidity of growth makes many, if not all, of the extensions to these facilities inadequate while they are still in the process of being planned, financed, engineered and built.

The real growth in population has outstripped every past estimate. The District of Columbia's sewage works were planned and built in the 1930's for a population of 650,000 in 1950 and provision for enlarging the plant for an ultimate tributary population of 850,000. These works served some 850,000 in 1950 and by 1980 will probably be serving some 2,000,000 people living in the District of Columbia and adjacent Maryland Counties. The growth has been so spectacular that the population forecasters themselves have scarcely been able to keep up with what is going on.

Estimates of total metropolitan population in 1980 have run somewhat as follows:

Date of Estimate	Estimated 1980 Population
1948	2,000,000
1951	2,100,000
1954	2,500,000
1956	2,750,000
1956	3,400,000
1957	3,500,000

Under these conditions it is not surprising that sewage treatment works have been quickly overloaded, that enlargements have lagged far behind the time of need, and that the River has grown fouler year by year. Interference by depression and war has aggravated the problem of too little, too late.

The Potomac River can be cleaned up. It will require attention to many details besides sewage treatment. A clean Potomac will materialize in Washington only when the River is no longer the receptacle for trash and waste of every description from every kind of source and when it is no longer the depository for vast quantities of silt washed from roads and farms, from river banks and construction jobs.

The things that can be done are set forth in this report. They will cost a great deal of money and some of them will need many years to accomplish. Only the people living in the Washington Metropolitan Area can decide whether or not the benefits, as appreciated by them, justify the cost of any or all of the measures described herein.

Many persons and agencies have generously contributed invaluable assistance to the investigation phases of this report. Cooperation has been outstanding in all cases and this is greatly appreciated. Special acknowlegment is made to: Ellis S. Tisdale, Director, and John DeWitt and Gilbert Kelso of the staff of the Interstate Commission on the Potomac River Basin; Colonel George Sumner, District Engineer, Byron Bird, Chief, Engineering Section and Raymond L. Irwin, Hydraulic Engineer, Washington District, U.S. Army Corps of Engineers; Harry B. Shaw, Chief Engineer, and Dr. Alfred Machis, Assistant to Chief Engineer, Washington Suburban Sanitary Commission; David V. Auld, Director of Sanitary Engineering, District of Columbia; A. T. Lundberg, County Manager, and F. H. Doe, Jr., Sanitary Engineer, Arlington County; Harry Hale, Sanitary Engineer, Fairfax County; James Corbalis, Jr., Engineer-Director, Alexandria Sanitation Authority; Dr. Jerome P. Pickard, Research Director, Washington Board of Trade; Paul C. Watt, Director, National Capital Regional Planning Council; John Nolen, Jr., Director, National Capital Planning Commission; William H. Moss, Northern Virginia Planning and Economic Development Commission; and Paul W. Reed, Chief, Water Pollution Control Section, Public Health Service.

THE POTOMAC RIVER

This report deals with the Potomac River and its tributaries from the mouth of Seneca Creek, 8 miles above Great Falls, south to the mouth of Occoquan Creek 12 miles below Alexandria, 40 miles downstream. (Figure 1). The subject is pollution and its removal. Since the purpose of pollution control is to enhance the beauty of the River and to increase its usefulness, the ends sought must be measured in terms of water supply, recreation, health and esthetic values.

Above Great Falls, the River is shallow. Except for silt, the quality of the water is good. The effects of upstream pollution have disappeared. From Great Falls to the District of Columbia, the River falls from the piedmont plateau through the Potomac gorge and flows into the Potomac estuary.[1/]

The Potomac is a flashy River; it rises and falls rapidly between wide extremes of flow. The flow, which averages about 11,000 cubic feet per second (cfs), ranges from an observed minimum of 800 cfs up to a peak of around 500,000 cfs. During sustained droughts, which in this area occur approximately every 10 years, the periods of low flow may last for several months. The amount of water flowing in the River during such periods will be decreased in the future by the increasing use of water for supplemental irrigation of farm lands in the Basin. Flows in excess of 400,000 cfs are experienced on the average of once every 20 or 30 years.[1/] The U.S. Corps of Engineers has estimated that there is a remote possibility that the flow at Washington might on occasion rise to 900,000 cfs. At present there are no storage reservoirs in the Potomac River Basin that are capable of significantly altering these extremes in discharge.

For about a century, the District of Columbia has drawn its water supply from the River just above Great Falls. Works are now being constructed, however, to take the supply when needed in the vicinity of Little Falls. The Washington Suburban Sanitary District will soon build an intake above the Falls and some years hence the Virginia Counties may go to the Potomac for their water supplies.

Within a few decades the amount of water taken from the River for municipal water supplies will exceed the present minimum flows. Without large storage projects to release water during droughts the River above Washington will be drawn dry and the flow downstream from the City will be almost entirely treated sewage. Storage of flood waters for use in sustaining minimum flows is urgently needed.

The River above tide water is visited daily by many sightseers and people seeking recreation, for the opportunities for picnicking, fishing, boating, cliff climbing and bird watching are abundant in the area. This part of the River must be maintained in an excellent state of cleanliness.

The tidal estuary of the Potomac River behaves as a lake or reservoir. During summer months 40 days are needed for the water to move downstream 15 miles from Three Sisters Islands to Fort Washington. Wind and tide have more influence on the movement of water than does the flow of the River.[3/] Into this sluggish pond the sewage of Metropolitan Washington is discharged, and in it settles the silt brought down from the 12,000 square mile Potomac Basin.[4/]

Below Key Bridge sewage begins to enter the River through storm water overflows and also is carried upstream by winds and tides from progressively more polluted downstream areas. At the mouth of Rock Creek and on down to Hains Point, large amounts of untreated sewage enter the River and Washington Channel during heavy rains. The Anacostia River also is polluted by storm water overflows and in former years received partially treated sewage. In the vicinity of Alexandria, untreated and partially treated sewage for many years entered the River from the District of Columbia Treatment Plant and from the Virginia communities.

The District plant at Blue Plains has been treating Washington Suburban Sanitary Commission sewage from the Anacostia Valley since October 1956. The Bladensburg plant, therefore, has been abandoned. At Blue Plains, works to provide secondary or so-called complete treatment are now under construction. Pentagon sewage, as well as sewage from several adjacent military establishments, is given high degree treatment and is discharged into Boundary Channel behind Columbia Island. Arlington County has recently rebuilt its primary plant, whose effluent discharges into Four Mile Run. The City of Alexandria has just placed a new treatment plant in operation on the North side of Hunting Creek. Fairfax County has a plant on the south side of the same creek. Both these plants provide fairly complete removal of pollutional matter from the sewage which reaches them, but Alexandria has a combined system from which raw sewage mixed with rainwater is discharged during storms.

The effluents from the above sewage plants are swept up the River by the tides. They mix throughout the upper estuary and oscillate back and forth in the City until the remaining pollution has decomposed and has been stabilized. Into this oscillating pond, when it rains, flow the untreated mixtures of sewage and surface water from Alexandria and from 70 combined sewer outlets scattered along the waterfronts and creeks within the District of Columbia. Pleasure craft and commercial boats add more raw sewage. When the River is low and the weather is hot, the estuary from Rock Creek to Fort Washington resembles a sewage lagoon.

The condition of the River in Washington has been observed for a number of years by means of sampling programs conducted by the District of Columbia, the Washington Suburban Sanitary District and the U.S. Corps of Engineers. The tests include temperature, dissolved oxygen, biochemical oxygen demand and bacteria. Since 1938 the District of Columbia has taken weekly samples, except during the colder months. The sampling points used by the District are shown in Figure 2. They were chosen to measure the upstream as well as the downstream effects of sewage discharges at Blue Plains and in Alexandria and Arlington County across the River. Figure 2 shows that the dissolved oxygen is lowest in this area and that the deficiencies are about the same upstream as they are downstream, as would be expected in a tidal basin with little natural river flow. In a situation of this kind the deficiency in oxygen is a reasonably good measure of the degree of pollution.

The tidal estuary in the Washington area is used for navigation and recreation. The Potomac River is navigable to Georgetown. The Anacostia River is navigable to a point about three miles above its confluence with the Potomac and by 1958 will be navigable as far as Bladensburg. Harbor facilities are available at Alexandria, at Georgetown, along Washington Channel and along the west bank of the Anacostia River. Shipping up the Potomac above Hains Point is confined to the movement of sand and gravel and of petroleum products to Georgetown. Shipping to docks at Alexandria and along Washington Channel and the Anacostia River is more significant, for it plays an important part in the overall economy of the region. The

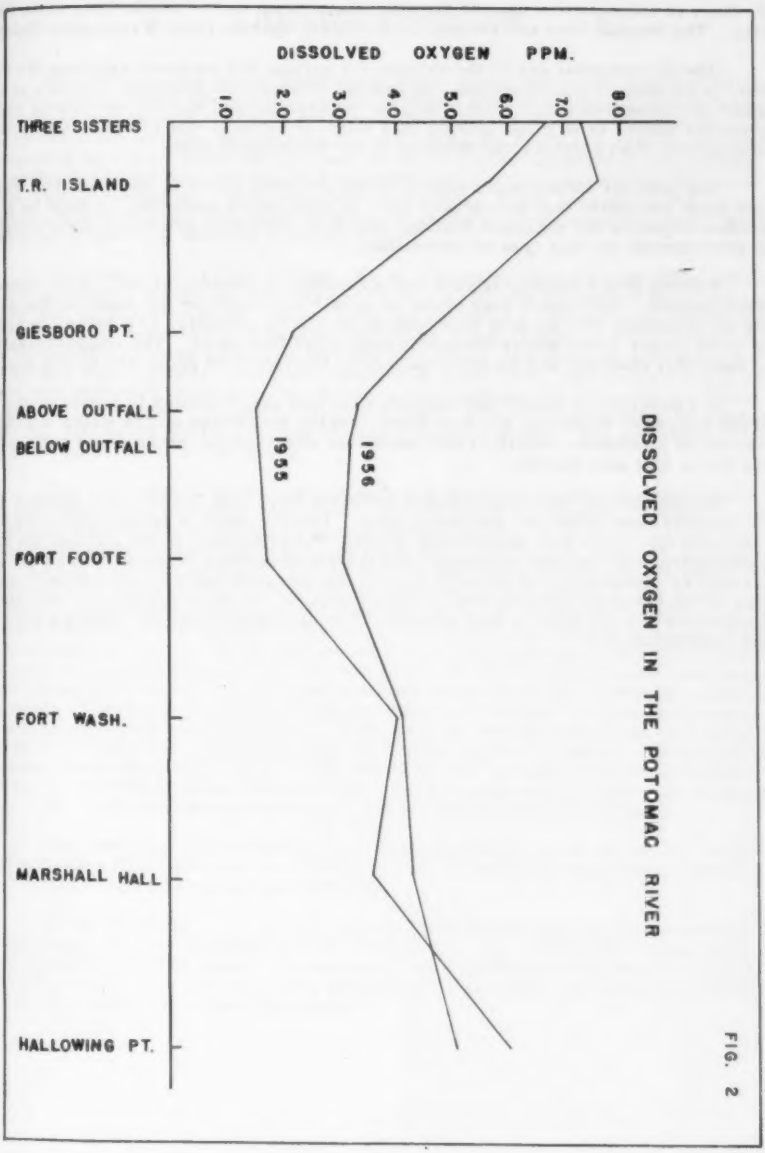

DISSOLVED OXYGEN PPM.
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
THREE SISTERS
T.R. ISLAND
GIESBORO PT.
ABOVE OUTFALL
BELOW OUTFALL
FORT FOOTE
FORT WASH.
MARSHALL HALL
HALLOWING PT.
1955
1956
DISSOLVED OXYGEN IN THE POTOMAC RIVER

FIG. 2

U. S. Navy is an important user of the ship channels up to its installations on the Anacostia. The Norfolk boat and several cruise boats operate from Washington Channel.

The recreational use of the estuary for sailing and pleasure cruising far exceeds, in number of craft involved, its use for commercial shipping. In view of the number of businesses which profit from the widespread and rapidly increasing use of pleasure boats, sailing and boating may soon, if not now, constitute a larger economic activity than commercial shipping in the Washington area.

Any plan for future improvement of the Potomac River in Metropolitan Washington must recognize that the estuary now, in spite of the pollution, is used by a multitude of people for pleasure boating, and must therefore provide a more acceptable environment for this type of recreation.

Fishing in the estuary is poor and swimming is unsafe, except above Three Sisters Islands. Although it may never be possible to improve the water in the estuary so swimming will be safe everywhere, it will be possible, at a price, to provide much larger areas where the public may enjoy this sport. The improvements that make this possible will be accompanied by the return of game fish to the area.

If a program of waterfront improvement and beautification is a part of the plan for a cleaner Potomac, not only those seeking recreation on the water but the thousands of picnickers, strollers and motorists who visit the parks along both sides of the River will also benefit.

During the last four years major additions have been made to the sewage disposal facilities and more are now being built. The decrease in sewage pollution during the next few years will improve the River. Nevertheless, in the light of the rapidly expanding metropolitan population and the accompanying increase in wastes, a great deal of additional work must be done if the potential esthetic and recreational values of the Potomac River are to be fully realized. Various methods of attaining this objective are set forth in this report. They all depend first on finding a solution to the problem of silt.

THE SILT PROBLEM

For people living in the Washington Area, silt is the worst pollutant of the Potomac River. Practically all of the silt brought down from the 12,000 square mile drainage area settles in the tidal estuary of the Potomac River in Washington. This silt blankets the bottom, smothering life and filling the basin at a rate which should cause deep concern. Since the presence of silt has been considered unavoidable, the problem has not been studied and the public has not been adequately informed about what is happening. The absence of widespread alarm over this problem is probably due also to the fact that for the past century, areas have been available for disposing of material dredged from the river.

The appearance of the Potomac River 100 years ago was quite different from what it is today. Water stood at the corner of 17th Street and Constitution Avenue. There was no Potomac Park. Hains Point did not exist. The Anacostia River was a broad stream bordered by extensive mud flats, since filled and converted to parks. The River then covered areas that are now airports. The Virginia shore has been moved into the Potomac. The great changes in water area and land elevation were made with material taken from the River, but in spite of this its depth has diminished over the years. If more parks remained to build or land to raise in following decades, silt would not be a matter of such serious concern. But now there is little room left on shore or in the River.

The total amount of silt depositing in the Washington area has never been measured nor even carefully estimated. The Corps of Engineers, in studies of the Riverbend Reservoir, assumed an annual silt production of 50 acre feet per 100 square miles of drainage area per year from the 1,800 square miles of piedmont plateau area above Riverbend. This is 40,000,000 cubic feet of silt per year. It represents an average rate of land surface erosion of one foot in 1,280 years. The piedmont plateau is the most rapidly eroding area in the Eastern United States. It is lined with small silt filled reservoirs. Careful measurement of the rate of silt accumulation in some of these reservoirs gave an average figure of around 30 cubic feet of silt per acre of drainage area per year. At this rate the annual production of silt from 1800 square miles of the piedmont area would be 35,000,000 cubic feet per year. There are 10,000 more square miles of Potomac drainage area above Washington which also produce silt. If the rate for this area is taken at 4 cubic feet per acre per year, or a foot of erosion in 10,000 years, the added contribution from the area above the piedmont is 25,000,000 cubic feet per year. It is estimated, therefore, that the Potomac River brings to the Washington area every year 60,000,000 cubic feet of silt and deposits most of it within the Metropolitan Area.

The Interstate Commission on the Potomac River Basin during the course of its 1953 study of the River in the Washington area, examined the bottom muds. Typical reports of the findings are as follows:

At Chain Bridge - "In the vicinity of Chain Bridge and for some distance downstream, the flow velocity is sufficient to keep the rock bottom swept fairly clean of settleable sediments. It was noted that submerged rocks were coated with a thin film of silt and attached plant growths and associated animals expected to be there were absent or extremely scarce."

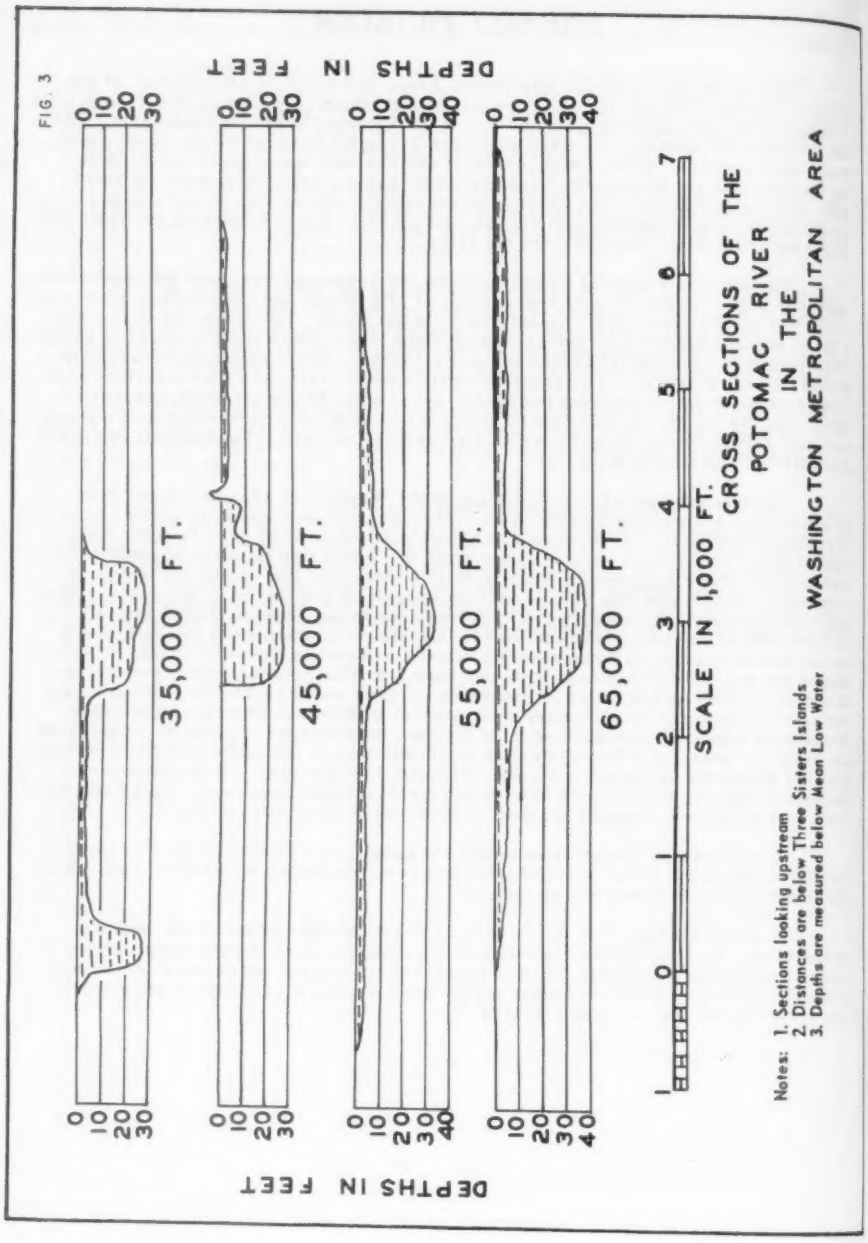


FIG. 3
DEPTHS IN FEET
0
10
20
30
35,000 FT.
45,000 FT.
40
55,000 FT.
65,000 FT.
SCALE IN 1,000 FT.
CROSS SECTIONS OF THE POTOMAC RIVER IN THE WASHINGTON METROPOLITAN AREA
Notes: 1. Sections looking upstream
2. Distances are below Three Sisters Islands
3. Depths are measured below Mean Low Water

At Roosevelt Island - "The fact that core sampling showed silt deposits to be more than nine feet thick indicates that it is erosional silt and not sewage solids that contribute to the mass of the bottom deposits."

Off Hains Point - "Silt deposits were more than 9 feet thick."

Opposite the District of Columbia Sewage Treatment Plant - "Silt deposits were more than 10 feet thick."

At Fort Washington - "Deposits were only four feet thick lying on gravel."

At Marshall Hall - "Two hundred feet from the east bank at Marshall Hall, where the bottom consisted of fine gravel, a number of animals more characteristic of clean water was found. This finding shows that quality of the overlying water does not in itself affect the development of normal bottom life as much as do the waterborne particles that settle out."

The River has deposited its tremendous burden of silt before reaching Marshall Hall. Figure 3 shows how this silt has filled the River except where continuous dredging keeps the channels clear.

Only four courses lie open with respect to silt: (1) reduce the rate of erosion, (2) remove the silt in upstream reservoirs, (3) dredge it from the River in Washington and (4) allow the River to fill.

The last alternative (4), is considered unacceptable. The third should be followed to the fullest extent practical in the future. Because of exhaustion of fill areas, it will probably be possible to dispose of amounts no greater than those carried to the River by Rock Creek, the Anacostia River and other local drainage areas. This leaves the first two alternatives.

The most impelling reason for erosion control is conservation of agricultural lands. Grass farming, contour plowing, terracing and strip planting all reduce erosion. The gradual adoption of these land conservation practices may ultimately reduce the silt load in the River. In any event they should be encouraged. Erosion control as practiced on farms is, however, no complete answer to the silt problem. Much of the erosion is along the River banks, gulleys and road side ditches. As is the case with farm lands, some of this can be controlled and some cannot. It is doubtful whether even the most complete erosion control program would reduce silt production by more than one-half over the whole of a large drainage basin. It is in the nature of geologic processes that rivers cut down the mountains. The Potomac brings the mountains to Washington.

Interception of the silt in one or more reservoirs offers the only reasonable solution of Washington's silt problem. The most important of these reservoirs is the one closest to Washington, for it will bear the brunt of the high erosion on the piedmont plateau. Although a reservoir must soon be built at Riverbend in order to provide an ample water supply for the Washington Region, it is here considered that an equally important function of this reservoir will be silt detention. In order to do the latter job the reservoir must be large.

The annual silt load of 60,000,000 cubic feet spread evenly to the water surface would completely fill the tidal Potomac from Chain Bridge to Fort Foote, below Alexandria, in 50 years. It would take 1000 years to fill the large Riverbend

Reservoir. Although neither the River nor the Reservoir will actually fill in a uniform manner, the calculated periods are in appropriate relationship to one another. The construction of reservoirs above Harpers Ferry, without building Riverbend, will worsen the situation in Washington, because a reduction in flood flow without removal of the Piedmont silt will concentrate the deposition in the Washington area. The spreading action of the great floods will have been lost.

The large Riverbend Reservoir should by all means be constructed, and silt detention for the purpose of purifying the River and preventing its destruction in Washington should be recognized as one of the reservoir's major functions.

The silt load carried by the River and its tributaries in the Washington area should be measured with regularity. A thorough study should be made of all dredging and filling operations and gravel excavation, and of changes in land and water elevations and depths, to determine accurately the rate at which silt has been deposited in Washington during past decades.

If the Riverbend Reservoir is built, a silt problem of some magnitude will remain due to the rapid erosion in the drainage areas of the Anacostia River, Rock Creek, Cabin John Creek and other local tributaries. The present high rate of erosion in these areas is partly due to extensive building operations and to thoughtlessness in handling excavated materials. When a trench or basement is excavated, the raw earth is often placed where runoff from heavy rainfall carries it rapidly away. Lawns are left unsodded, and roadside ditches are built without check dams or grass cover. Soil erosion during and immediately following new construction can be reduced. These accomplishments, as well as encouragement of general erosion control practices, would be a worthy endeavor on the part of local citizens' groups and improvement associations.

The silt problem is of such magnitude that its solution should take precedence over all other pollution control activities in Metropolitan Washington. If this problem is not solved; if the River is left to fill with sediment, efforts to develop the recreational uses of the Potomac River in Washington will be almost fruitless.

QUANTITIES OF SEWAGE

In order to assess the magnitude of the sewage disposal problem in the Washington Metropolitan Area and to develop an adequate and properly scheduled area-wide plan for meeting this problem, it has first been necessary to forecast future populations. This was done by selecting values for the sewered population expected in the entire area and in its major political subdivisions. The future populations were then distributed among 36 drainage areas tributary to the Potomac River and to an additional two areas tributary to the Patuxent. These drainage areas have been so chosen as to facilitate calculation of the required capacity of major sewers and sewage treatment plants. (cf. Tables 2, 3, 4 and 5 and Figure 1)

Three sources of information were used in arriving at figures for the populations to be served by sanitary sewerage systems at various future dates. These were (1) forecasts made in connection with past engineering studies of the pollution problem at Washington,[5/6/7/8/9/10] (2) recent comprehensive population studies conducted by the Council for Economic and Industry Research, by Homer Hoyt Associates, and by Dr. Jerome P. Pickard of the Washington Board of Trade, and (3) forecasts for individual drainage areas prepared for this study by the various agencies responsible for the construction and operation of the sewers and sewage treatment works. In the selection of over-all figures, greatest dependence was placed on the work done by the group listed under (2) above. The details and results of these studies appear in a fine series of publications all of which deal specifically with the many factors determining the past and future growth of the Washington Metropolitan Area.[11/12/13/14/15/16]

The figures for sewered populations selected for use in this study are compared, in Table 1, with a recent forecast of total population.[10] A further breakdown into population distribution by drainage area or portions thereof lying within various political jurisdictions appears in Table 2. The last column of this table indicates the over-all population densities predicted for the year 2000 A. D. The density values, ranging down to less than two persons per acre in some of the suburban areas, suggests that the estimate of a total sewered population of 4,000,000 in 2000 is probably not excessive. With regard to the population estimate, the degree of uncertainty is low for those areas already approaching saturation, while great uncertainties are inherent in predictions which apply to the future fringe areas beyond the present scene of active suburban development. When designing relatively permanent utilities like sewers, the time scale of a population forecast may not be too important provided the actual growth rate does not so greatly exceed the forecast as to seriously disturb an orderly sequence of study, planning, finance and construction. Barring the latter type of difficulty, an earlier appearance of population than has been anticipated will bring with it the financial resources for further extensions and enlargements. On the other hand, if growths are slower than predicted, the works will be adequate for a period beyond the design date. In these days of inflation, some overbuilding is not particularly serious because of the future probable rises in costs.

The estimated growth of the sewered population to 4,000,000 by the year 2000 represents a reasonably safe guide in the search for a policy of providing facilities which avoids building too little, too late on the one hand and, on the other,

overburdening the present population with too great an investment in the interest and for the benefit of future generations.

In order to calculate the quantities of sanitary sewage to be dealt with, the following average annual per capita rates have been assumed to be applicable to the entire area:

Year	Gallons per capita daily (gpcd)
1960	110
1970	115
1980	125
2000	140

These values include an allowance for groundwater infiltration, footing drainage and rainwater. It is assumed that an effort will be made to keep water from these sources to a reasonable minimum in sanitary sewers. The above values differ somewhat from those used in different parts of the metropolitan area. They do represent, however, a general average of locally accepted values. The total average annual flows of sanitary sewage from drainage areas within the various political subdivisions are shown in Tables 2 and 3. It is estimated that total sanitary sewage flow will increase from around 215 million gallons daily (mgd) in 1960 to 560 mgd in 2000 A. D.

The pollutional potentialities of this sewage are best measured in terms of the oxygen required to decompose (biochemically burn) the entrained organic matter, and the solid matter carried in suspension. Oxygen requirements are measured by a test, the Biochemical Oxygen Demand (BOD), in which the consumption of dissolved oxygen (DO) is observed after 5 days incubation at a temperature of 20 degrees centigrade. Calculations of biochemical oxygen demand and suspended solids, set forth in Tables 4 and 5, are based on an assumed daily per capita contribution of 0.23 pound of BOD* and 0.27 pound of suspended matter. To dispose of sanitary sewage in the year 2000, treatment works and streams in the area will each day have to provide 920,000 pounds of oxygen and care for 1,080,000 pounds of suspended sewage solids.

Sanitary sewers must carry, without overflowing, the maximum amount of sewage which reaches them. Peak flows of sewage are often several times greater than the average rates stated above. In order to calculate peak flows for use in estimating or checking trunk sewer capacities the curve of Figure 4 has been selected. Actual calculations of maximum rates are made later in connection with examination of individual sewer and treatment plant capacities.

For sanitary interceptors serving areas having combined sewers, it will be necessary to add some multiple of either the average or the peak sanitary (dry weather) sewage flow in order to determine the desirable capacity of trunk lines leading to the disposal plants. The estimates and calculations of storm water capacity needed for interceptors receiving combined sewage appear with the discussions of the various main sewers.

* The basis for choosing this value is discussed on page 25.

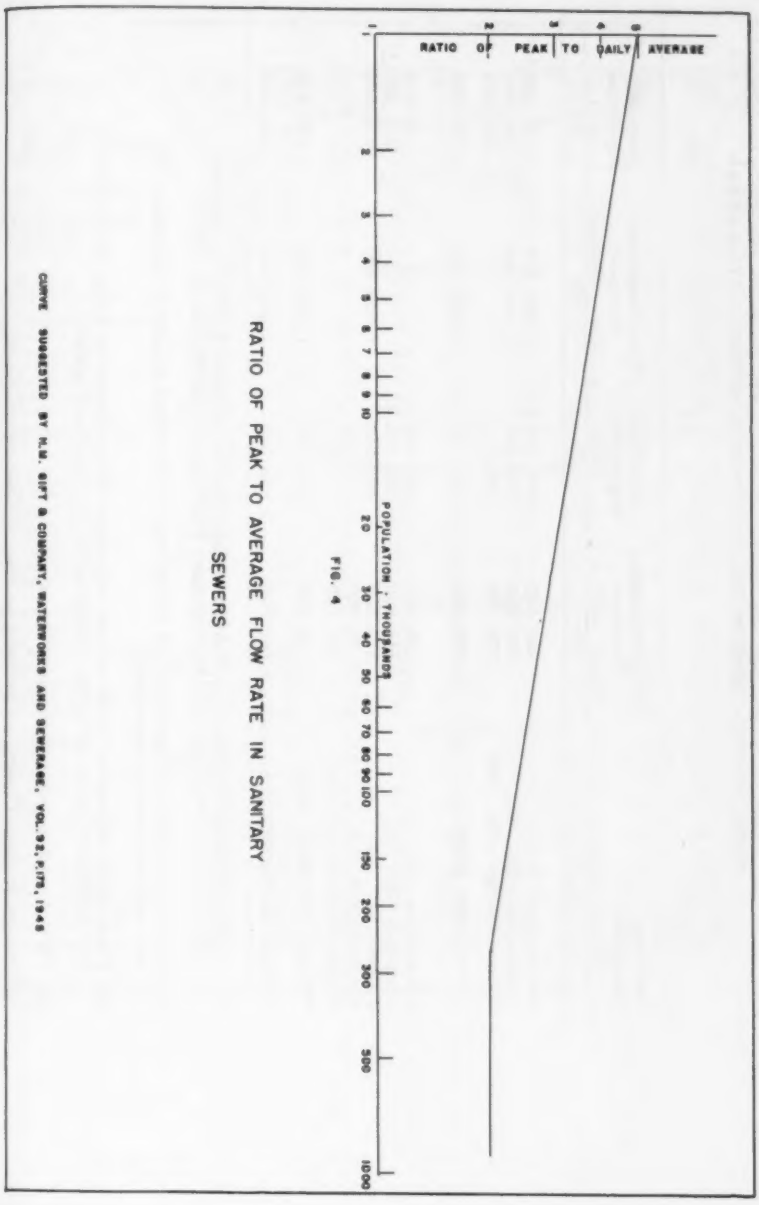


FIG. 4

RATIO OF PEAK TO AVERAGE FLOW RATE IN SANITARY SEWERS

CURVE SUGGESTED BY H.M. GIFT & COMPANY, WATERWORKS AND SEWERAGE, VOL. 92, P. 179, 1945

Table 1 - COMPARISON OF FORECAST OF SEWERED POPULATIONS WITH RECENT FORECAST OF TOTAL POPULATIONS IN THE WASHINGTON METROPOLITAN AREA 1/

Political Subdivision (1)	Total Population Forecast IV/1/ 1980 1/ (2)	Sewered Population 1980 (3)	Total Population Forecast IV/1/ 2000 1/ (4)	Sewered Population 2000 (5)
Washington, D.C.	940,000	1,070,000 2/	1,000,000	1,130,000 2/
Montgomery Co., Md.	670,000	500,000	2,300,000	740,000
Prince George's Co., Md.	770,000	600,000		900,000
TOTAL MD. SIDE	2,380,000,	2,170,000	3,300,000	2,770,000
Alexandria, Va.	125,000	120,000		140,000
Arlington Co., Va.	210,000	245,000 3/		275,000 3/
Fairfax, Co., Va.	570,000	495,000	1,500,000	815,000
Falls Church, Va.	15,000	4/		4/
Prince William Co., Va.	200,000	5/		5/
TOTAL VIRGINIA SIDE	1,120,000	860,000	1,500,000	1,230,000
TOTAL METROPOLITAN AREA	3,500,000	3,030,000	4,800,000	4,000,000

1/ Total Population figures from Table 3 of paper by Dr. Jerome P. Pickard entitled "The Growth of Population in Metropolitan Washington," dated June 27, 1957.

2/ Figures for sewered population of the District of Columbia include an allowance for non-resident daytime population.

3/ Figures for Arlington County include allowance for population in Falls Church and Fairfax County sewered by the Arlington County sewerage system.

4/ Falls Church population included elsewhere.

5/ Prince William County not included in area covered by this study.

Table 2 - ESTIMATES OF POPULATIONS AND QUANTITIES OF SANITARY SEWAGE IN PRINCIPAL WATERSHEDS OF THE WASHINGTON, D.C. METROPOLITAN AREA

Name of Drainage Area	Area (Sq. mi)	Sewered Population (1000s)				Average Sewage Flow (mgd)				Persons per acre
		1960	1970	1980	2000	1960	1970	1980	2000	2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Arlington County, Virginia*										
Potomac, Arlington		72	80	84	100	7.9	9.2	10.5	14.0	
Four Mile Run, Arlington		138	150	161	175	15.2	17.2	20.1	24.5	
TOTALS	29.6	210	230	245	275	23.1	26.4	30.6	38.5	14.5
Alexandria, Virginia										
Potomac, Alexandria	2.0	22	24	26	30	2.4	2.7	3.3	4.2	23.4
Hooff's Run	6.2	53	59	64	71	5.8	6.9	8.0	9.9	17.9
Holmes-Cameron Run	5.8	18	22	26	34	2.0	2.5	3.2	4.8	9.2
Four Mile Run	1.5	2	3	4	5	0.2	0.3	0.5	0.7	5.2
TOTALS	15.5	95	108	120	140	10.4	12.4	15.0	19.6	14.1
Fairfax County, Virginia										
Cameron Run	54.0	115	180	225	290	12.7	20.7	28.2	40.5	8.4
Little Hunting Creek	10.4	15	30	40	55	1.6	3.4	5.0	7.7	8.3
Dogue Creek	12.2	13	30	40	60	1.4	3.4	5.0	8.4	7.7
Upper Pimmit & Dead Run	14.5	15	20	30	45	1.6	2.3	3.7	6.3	4.8
Potomac Gorge	7.5	1	2	3	5	0.1	0.2	0.4	0.7	1.0
Potomac, Fairfax	108.0	5	19	60	135	0.6	2.2	7.5	18.9	2.0
Accotink Creek	51.0	5	19	60	135	0.6	2.2	7.5	18.9	4.1
Pohick-Giles Run	50.0	3	12	22	50	0.3	1.4	2.7	7.0	1.6
Occoquan Creek	116.0	3	10	15	40	0.3	1.2	1.9	5.6	0.5
TOTALS	423.6	175	322	495	815	19.2	37.0	61.9	114.0	3.0
TOTAL VIRGINIA	468.7	480	660	860	1230	52.7	75.8	107.5	172.1	4.1
Montgomery County, Maryland										
Great Seneca Creek	61.2	1	3	10	50	0.1	0.3	1.2	7.0	1.3
Muddy Branch	19.9	1	3	10	35	0.1	0.3	1.2	4.9	2.7
Watts Branch	25.8	2	5	30	55	0.2	0.6	3.8	7.7	3.3
Cabin John Creek	34.9	41	63	90	125	4.5	7.3	11.3	17.5	5.6
Little Falls Branch	4.8	28	29	30	35	3.1	3.3	3.7	4.9	11.4
Rock Creek	64.8	107	127	150	200	11.8	14.6	18.8	28.0	4.8
Anacostia River	59.3	80	150	180	240	8.8	17.3	22.5	33.6	7.3
TOTALS	263.1	260	380	500	740	28.6	43.7	62.5	105.6	4.4
Prince George's County, Maryland										
Anacostia River	92.2	210	250	280	305	23.1	28.8	35.0	42.7	4.8
Laurel-Patuxent	12.8	10	20	30	50	1.1	2.3	3.7	7.0	6.3
Western Branch	80.8	10	30	60	110	1.1	3.4	7.5	15.4	2.1
Watts Branch - Piney Branch	2.5	10	12	15	20	1.1	1.4	1.9	2.8	12.5
Oxon Run	12.7	40	60	80	120	4.4	6.9	10.0	16.8	14.8
Henson Creek	31.5	15	50	85	175	1.6	5.8	10.6	24.5	8.7
Piscataway Creek	68.2	5	28	50	120	0.6	3.2	6.3	16.8	2.8
TOTALS	308.5	300	450	600	900	33.0	51.8	75.0	126.0	4.6
District of Columbia										
Upper Potomac	6.7	55	66	73	80	6.1	7.6	9.1	11.2	18.7
Rock Creek	17.0	294	310	321	331	32.4	35.7	40.2	46.4	30.4
B Street & New Jersey Ave.	3.9	58	59	60	61	6.4	6.8	7.5	8.6	24.4
Tiber Creek	1.8	62	64	65	66	6.8	7.4	8.1	9.2	57.3
East Side	13.1	252	273	287	300	27.7	31.4	36.0	42.0	35.8
Maryland Anacostia	1.6	13	17	20	22	1.4	2.0	2.5	3.1	21.4
Anacostia Main	9.8	116	143	160	180	12.7	16.4	20.0	25.2	28.7
Outfall	2.7	21	22	24	25	2.3	2.5	3.0	3.5	14.5
Oxon Run	3.5	49	56	60	65	5.4	6.4	7.5	9.1	29.0
TOTAL TO OUTFALL	53.9	850	932	986	1040	93.5	107.3	123.4	145.7	30.0
TOTAL DISTRICT	60.1	920	1010	1070	1130	101.2	116.2	133.9	158.3	29.4
TOTAL MARYLAND	571.6	560	830	1100	1640	61.6	95.5	137.5	229.6	4.5
TOTAL MD. & D.C.	631.7	1480	1840	2170	2770	162.8	211.7	271.4	387.9	6.9
TOTAL MET. AREA	1100	1960	2500	3030	4000	215.5	287.5	378.9	560	5.7

* Includes part of Fairfax County but not most of undevelopable Federal Property.

Table 3 - POPULATION AND AVERAGE SANITARY FLOW

Source of Sewage	Population(1000s) 2000		Flow of Sanitary Sewage (mgd)							
			1960		1970		1980		2000	
	From Area	Cumulative	From Area	Cumulative	From Area	Cumulative	From Area	Cumulative	From Area	Cumulative
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Blue Plains Plant - District of Columbia										
Seneca Creek	50	50	0.1	0.1	0.3	0.3	1.2	1.2	7.0	7.0
Muddy Branch	35	85	0.1	0.2	0.3	0.6	1.2	2.4	4.9	11.9
Watts Branch	55	140	0.2	0.4	0.6	1.2	3.8	6.2	7.7	19.6
Potomac, Fairfax	135	275	0.6	1.0	2.2	3.4	7.5	13.7	18.9	38.5
Cabin John Creek	125	400	4.5	5.5	7.3	10.7	11.3	25.0	17.5	56.0
Little Falls Branch	35	435	3.1	8.6	3.3	14.0	3.7	28.7	4.9	60.9
Upper Potomac	80	515	6.1	14.7	7.6	21.6	9.1	37.8	11.2	72.1
Rock Creek, Montgomery	200	715	11.8	26.5	14.6	36.2	18.8	56.6	28.0	100.1
Rock Creek, D.C.	331	1046	32.4	48.9	35.7	71.9	40.2	96.8	46.4	146.5
B St. & N.J. Ave.	61	1107	6.4	65.3	6.8	78.7	7.5	104.3	8.6	155.1
East Side	300	1407	27.7	93.0	31.4	110.1	36.0	140.3	42.0	197.1
Tiber Creek	66	1473	6.8	99.8	7.4	117.5	8.1	148.4	9.2	206.3
Anacostia, Montgomery	240	240	8.8	8.8	17.3	17.3	22.5	22.5	33.6	33.6
Anacostia, Prince Geo.	305	545	23.1	31.9	28.8	46.1	35.0	57.5	42.7	76.3
Watts & Piney Brs.	20	565	1.1	33.0	1.4	47.5	1.9	59.4	2.8	79.1
Md. Anacostia	22	587	1.4	34.4	2.0	49.5	2.5	61.9	3.1	82.2
Anacostia Main	180	767	12.7	47.1	16.4	65.9	20.0	81.9	25.2	107.4
Outfall	25	792	2.3	49.4	2.5	68.4	3.0	84.9	3.5	110.9
		2265		149.2		185.9		233.3		317.2
Oxon Run, D.C.	65	65	5.4	5.4	6.4	6.4	7.5	7.5	9.1	9.1
Oxon Run, Md.	120	185	4.4	9.8	6.9	13.3	10.0	17.5	16.8	25.9
		2450		159.0		199.2		250.8		343.1
Arlington County Plant										
Upper Pimmit & Dead Run	45	45	1.6	1.6	2.3	2.3	3.7	3.7	6.3	6.3
Potomac Gorge	5	50	0.1	1.7	0.2	2.5	0.4	4.1	0.7	7.0
Potomac, Arlington	100	150	7.9	9.6	9.2	11.7	10.5	14.6	14.0	21.0
Four Mile Run, Arlington	175	325	15.2	24.8	17.2	28.9	20.1	34.7	24.5	45.5
Alexandria Plant										
Potomac, Alexandria	30	30	2.4	2.4	2.7	2.7	3.3	3.3	4.2	4.2
Hooff's Run	71	101	5.8	8.2	6.9	9.6	8.0	11.3	9.9	14.1
Holmes-Cameron Run	34	135	2.0	10.2	2.5	12.1	3.2	14.5	4.8	18.9
Four Mile Run, Alexandria	5	140	0.2	10.4	0.3	12.4	0.5	15.0	0.7	19.6
Fairfax County Plant										
Cameron Run	290		12.7		20.7		28.2		40.5	
Miscellaneous Drainage Areas										
Little Hunting Creek	55		1.6		3.4		5.0		7.7	
Dogue Creek	60		1.4		3.4		5.0		8.4	
Accotink	135		0.6		2.2		7.5		18.9	
Pohick-Giles	50		0.3		1.4		2.7		7.0	
Occoquan	40		0.3		1.2		1.9		5.6	
Laurel-Patuxent	50		1.1		2.3		3.7		7.0	
Western Branch	110		1.1		3.4		7.5		15.4	
Henson Creek	175		1.6		5.8		10.6		24.5	
Piscataway Creek	120		0.6		3.2		6.3		16.8	

Table 4 - AVERAGE DAILY PRODUCTION OF BIOCHEMICAL OXYGEN DEMAND

Source of Sewage	5-Day 20° C Biochemical Oxygen Demand (1000 lb/day) 1960 From Area	1960 Cumulative	1970 From Area	1970 Cumulative	1980 From Area	1980 Cumulative	2000 From Area	2000 Cumulative
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blue Plains Plant - District of Columbia								
Seneca Creek	0.2	0.2	0.7	0.7	2.3	2.3	11.5	11.5
Muddy Branch	0.2	0.4	0.7	1.4	2.3	4.6	8.1	19.6
Watts Branch	0.3	0.7	1.2	2.6	6.9	11.5	12.6	32.2
Potomac, Fairfax	1.2	1.9	4.4	7.0	13.8	25.3	31.0	63.2
Cabin John Creek	9.5	11.4	14.5	21.5	20.7	46.7	28.8	92.0
Little Falls Branch	6.5	17.9	6.7	28.2	6.9	52.9	8.1	100.1
Upper Potomac	12.7	30.6	15.2	43.4	16.8	69.7	18.4	118.5
Rock Creek, Montgomery	24.6	55.2	29.2	72.6	34.5	104.2	46.0	164.5
Rock Creek, D.C.	67.6	122.8	71.3	143.9	73.8	178.0	76.1	240.6
B St. & N. J. Ave.	13.3	136.1	13.6	157.5	13.8	191.8	14.0	254.6
East Side	58.0	194.1	62.8	220.3	66.1	257.9	69.0	323.6
Tiber Creek	14.3	208.4	14.7	235.0	14.9	272.8	15.2	338.8
Anacostia, Montgomery	18.4	18.4	34.5	34.5	41.4	41.4	55.2	55.2
Anacostia, Prince Geo.	48.3	66.7	57.5	92.0	64.5	105.9	70.2	125.4
Watts and Piney Brs.	2.3	69.0	2.8	94.8	3.5	109.4	4.6	130.0
Md. Anacostia	3.0	72.0	3.9	98.7	4.6	114.0	5.1	135.1
Anacostia Main	26.6	98.6	32.9	131.6	36.8	150.8	41.4	176.5
Outfall	4.8	103.4	5.1	136.7	5.5	156.3	5.8	182.3
		311.4		371.7		429.1		521.1
Oxon Run, D.C.	11.3	11.3	12.9	12.9	13.8	13.8	15.0	15.0
Oxon Run, Md.	9.2	20.5	13.8	26.7	18.4	32.2	27.6	42.6
		332.3		398.4		461.3		563.7
Arlington County Plant								
Upper Pimmit & Dead Run	3.5	3.5	4.6	4.6	6.9	6.9	10.4	10.4
Potomac Gorge	0.2	3.7	0.5	5.1	0.7	7.6	1.2	11.6
Potomac, Arlington	16.6	20.3	18.4	23.5	19.3	26.9	23.0	34.6
Four Mile Run, Arlington	31.7	52.0	34.5	58.0	37.0	63.9	40.2	74.8
								638.5
Alexandria Plant								
Potomac, Alexandria	5.1	5.1	5.5	5.5	6.0	6.0	6.9	6.9
Hooff's Run	12.2	17.3	13.6	19.1	14.7	20.7	16.3	23.2
Holmes-Cameron	4.1	21.4	5.1	24.2	6.0	26.7	7.8	31.0
Four Mile Run, Alexandria	0.5	21.9	0.7	24.9	0.9	27.6	1.2	32.2
								670.7
Fairfax County								
Cameron Run	26.4		41.5		51.8		66.8	
Miscellaneous Drainage Areas								
Little Hunting	3.5		6.9		9.2		12.6	
Dogue Creek	3.0		6.9		9.2		13.8	
Accotink	1.2		4.3		13.8		31.0	
Pohick-Giles	0.7		2.8		5.1		11.5	
Occoquan	0.7		2.3		3.4		9.2	
Laurel-Patuxent	2.3		4.6		6.9		11.5	
Western Branch	2.3		6.9		13.8		25.3	
Henson Creek	3.5		11.5		19.5		40.2	
Piscataway Creek	1.2		6.5		11.5		27.6	
							920.8	

Table 5 - SUSPENDED SEWAGE SOLIDS

Source of Sewage	Suspended Solids (1000 lb/day) 1960 From Area	1960 Cumulative	1970 From Area	1970 Cumulative	1980 From Area	1980 Cumulative	2000 From Area	2000 Cumulative
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Blue Plains Plant - District of Columbia								
Seneca Creek	0.3	0.3	0.8	0.8	2.7	2.7	13.5	13.5
Muddy Branch	0.3	0.6	0.8	1.6	2.7	5.4	9.5	23.0
Watts Branch	0.5	1.1	1.4	3.0	8.1	13.5	14.9	37.9
Potomac, Fairfax Co.	1.4	2.5	5.1	8.1	16.2	29.7	36.4	74.3
Cabin John Creek	11.1	13.6	17.0	25.1	24.3	54.0	33.7	108.0
Little Falls Branch	7.6	21.2	7.8	32.9	8.1	62.1	9.5	117.5
Upper Potomac	14.9	36.1	17.8	50.7	19.7	81.8	21.6	139.1
Rock Creek, Montgomery Co.	28.9	65.0	34.3	85.0	40.5	122.3	54.0	193.1
Rock Creek, D.C.	79.5	144.5	83.8	168.8	86.8	209.1	89.5	282.6
B St. and N. J. Ave.	15.7	160.2	15.9	184.7	16.2	225.3	16.5	299.1
East Side	68.1	228.3	73.8	258.5	77.5	302.8	81.0	380.1
Tiber Creek	16.7	245.0	17.3	275.8	17.5	320.3	17.8	397.9
Anacostia, Montgomery Co.	21.6	21.6	40.5	40.5	48.6	48.6	64.8	64.8
Anacostia, Prince Geo. Co.	57.7	78.3	67.5	108.0	75.6	124.2	82.4	147.2
Watts & Piney Brs.	2.7	81.0	3.2	111.2	4.1	128.3	5.4	152.6
Md. Anacostia	3.5	84.5	4.6	115.8	5.4	133.7	6.0	158.6
Anacostia Main	31.3	115.8	38.6	154.4	43.2	176.9	48.6	207.2
Outfall	5.7	121.5	5.9	160.3	6.5	183.4	6.8	214.0
		366.5		436.1		503.7		611.9
Oxon Run, D.C.	13.2	13.2	15.1	15.1	16.2	16.2	17.6	17.6
Oxon Run, Md.	10.8	24.0	16.2	31.3	21.6	37.8	32.4	50.0
		390.5		467.4		541.5		661.9
Arlington County Plant								
Upper Pimmit & Dead Run	4.1	4.1	5.4	5.4	8.1	8.1	12.2	12.2
Potomac Gorge	0.3	4.4	0.5	5.9	0.8	8.9	1.4	13.6
Potomac, Arlington Co.	19.4	23.8	21.6	27.5	22.7	31.6	27.0	40.6
Four Mile Run, Arlington Co.	37.1	60.9	40.5	68.0	43.5	75.1	47.2	87.8
Alexandria Plant								
Potomac, Alexandria	5.9	5.9	6.5	6.5	7.0	7.0	8.1	8.1
Hooff's Run	14.4	20.3	15.9	22.4	17.3	24.3	19.1	27.2
Holmes-Cameron	4.9	25.2	5.9	28.3	7.0	31.3	9.2	36.4
Four Mile Run, Alexandria	0.5	25.7	0.8	29.1	1.1	32.4	1.3	37.7
Fairfax County Plant								
Cameron Run	31.0		48.6		60.8		78.3	
Miscellaneous Drainage Areas								
Little Hunting	4.1		8.1		10.8		14.9	
Dogue Creek	3.5		8.1		10.8		16.2	
Accotink	1.4		5.1		16.2		36.5	
Pohick-Giles	0.8		3.2		5.9		13.5	
Occoquan	0.8		2.7		4.1		10.8	
Laurel-Patuxent	2.7		5.4		8.1		13.5	
Western Branch	2.7		8.1		16.2		29.7	
Henson Creek	4.0		13.5		23.0		47.2	
Piscataway Creek	1.4		7.6		13.5		32.4	
			674.9				1080.4	

SEWAGE TREATMENT

The above estimates of quantities of sewage and pollutional matter are considerably in excess of those used in formulating existing plans for the extension of sewage treatment facilities in the Washington Metropolitan Area. It is appropriate, therefore, before proposing additional corrective measures, to examine existing plans, particularly with regard to scheduling of construction.

During the last three or four years a great deal of work has been accomplished toward reduction of sewage pollution of the Potomac River. The condition of the River will undoubtedly show marked improvement during the next few years as the work just finished or now under construction comes into full operation and as sewage solids accumulated on the River bottom stabilize or are covered with silt.

The amount of study, planning and design accomplished in the last few years is indicated by the following list of reports which have appeared since February, 1954.

1. A report on Water Pollution in the Washington Metropolitan Area - Interstate Commission on the Potomac River Basin, February 1954.

2. Metropolitan Area of Northern Virginia - Report on Sewage Disposal - Alexander Potter Associates and Greeley and Hansen, June 1954.

3. City of Alexandria, Va., Sanitation Authority - Report on Sewage Disposal Project - Greeley and Hansen Engineers, August 9, 1954.

4. Report to David V. Auld, Director of Sanitary Engineering, District of Columbia upon Investigation of Sewerage System - Metcalf and Eddy Engineers, June 1955.

5. Report to District of Columbia, Department of Sanitary Engineering on Sewage Treatment Plant - S. A. Greeley, F. A. Marston, G. J. Requardt, Board of Engineers, October 31, 1956.

6. Report to District of Columbia Department of Sanitary Engineering on Improvements to Sewerage System; S. A. Greeley, F. A. Marston and G. J. Requardt, Board of Engineers, February 28, 1957.

These major reports have been supplemented by numerous less voluminous studies, reports and papers and by intensive study, promotion, negotiation and cooperation by the political representatives and by the planning, administrative and engineering staffs of all the governmental subdivisions of the Washington Metropolitan Area.

The District of Columbia completed additions to settling and sludge digestion facilities in 1952, built a chlorination plant in 1955, erected sludge drying facilities in 1956 and has under construction a high rate activated sludge plant to be completed in 1958.

The Washington Suburban Sanitary District abandoned its overloaded Anacostia River Primary Plant and began delivering its sewage to the District of Columbia plant in 1956. As the program for extension of trunk sewers into and up the main drainage areas of Montgomery and Prince George's County has progressed, several other smaller sewage plants serving local areas have been abandoned.

In 1956, the Alexandria Sanitation Authority set in operation sewers, pumping stations and a treatment plant which ended a century old practice of discharging untreated sewage directly into the Potomac River. Through cooperative arrangements the Sanitation Authority will treat part of the sewage from the Holmes Run and the Cameron Run drainage areas in Fairfax County.

Arlington County improved its sewerage system and built a new primary sewage plant in 1953 to replace a heavily overloaded plant from which by-passed raw sewage entered Four Mile Run.

Fairfax County began operating its Hunting Creek Plant in 1956.

Completion in a period of only 4 years of the above additions to the sewage collection and treatment facilities is a great accomplishment and culminates years of effort directed towards improving the condition of the Potomac River in the Washington area.

The magnitude of the present program for abatement of pollution in the Washington area is indicated by the expenditures listed in Table 6. These apply only to the 10 year period from 1950 to 1960.

The construction work during the present decade is part of a long range program designed to maintain the River in reasonably good condition up to the year 2000. The program is based on the assumption that the River can assimilate 120,000 pounds per day BOD carried by treated sewage effluents. This figure, which was developed by studying past records of sanitary conditions of the River, will be used to examine the existing schedule of improvements and to judge the extent to which the present plan may need to be accelerated.

Since the sewage from drainage areas below Oxon Run on the Maryland side and Cameron Run on the Virginia side will discharge downstream from the critical area, the downriver basins are not included in this comparison. The acceptability of the 120,000 pound per day BOD loading and the influence of discharges downstream from the present Metropolitan Area will be discussed further in connection with measures which go beyond the existing plan.

In Table 7 two sets of population figures are compared, those used in preparing the existing plan and those adopted for this study. For the year 2000, the latter population estimates exceed the former by 615,000 for Maryland and the District of Columbia and 238,400 for the Virginia areas. The total difference of 853,400 is 36 percent greater than the estimate of 2,315,600 used in the existing plan. The degrees of treatment recommended in the existing plan to hold the sewage load on the River down to 120,000 pounds of BOD per day are compared in Table 8 with similar figures developed as part of this study.

The quantities of BOD expected to be discharged under the existing program are shown in Figure 5. Under this program all communities will attain 80 percent removal of BOD by 1985. It was anticipated that this treatment should be adequate

until the year 2000. From our present study, based on current information relative to future population growths, all communities should have installed, by about 1970, complete treatment plants capable of removing 80 percent of the oxygen consuming pollutional matter.

The indicated rescheduling is based on two important figures in addition to the new population estimates. One is the assumption that in order to maintain satisfactory conditions in the River the total oxygen demand of all treated sewage effluents should be kept at or below 120,000 pounds per day. The other assumption is that the per capita production of oxygen demanding materials will be 0.23 pound per day. Since uncertainties surround both these figures discussion of them is desirable.

The assumption of 120,000 pounds per day BOD as the acceptable load upon the River is based upon records and observations of the condition of the Potomac in the Washington Region under past and present sewage loads. In terms of the type of sewage effluents discharged in the past and with regard to oxygen conditions only, this may be a reasonable and satisfactory figure. The secondary treatment plant effluents of the future, however, will be different from the raw and partially treated sewage discharges of the past. The future effluents will have low contents of suspended and settleable matter, they will be much clearer, and they will contain nitrogen and phosphorus in a form available for plant food. In respect to their clarity, the treated effluents will be far less objectionable than past sewage discharges. They will permit, however, the admission of more light to the river depths. This light, together with larger quantities of mineralized nitrogen and phosphorus compounds, will doubtless result in the establishment of a new biological regime. Algae will grow more abundantly and unless kept in balance by other living organisms may in turn produce undesirable conditions. It is exceedingly difficult to predict just what may happen in the River as increasing quantities of more completely treated sewage are added from year to year. It is certain, however, that so long as increasing amounts of treated sewage are discharged to the Potomac, the River will be continually more heavily fertilized. This difficult question of biological behavior of the River under future conditions will be mentioned further when suggesting additional measures for controlling pollution.

With regard to the figure of 0.23 pound per capita daily for the production of oxygen consuming organic matter, uncertainty arises primarily from a lack of knowledge as to the future expansion in the use of garbage grinders. Disposal of garbage to the sewers places on the sewage treatment plants and the River the burden of oxidation formerly carried by municipal incinerators. That this can constitute an appreciable increase in the pollutional matter carried by sewage is readily apparent. In Jasper, Indiana, which has given up garbage collection and required all householders to install grinders, the BOD load has risen to 0.32 pound per capita daily. The District of Columbia production of BOD was calculated to be 0.207 pound per capita daily over the period from 1951 to 1955. This higher than usual figure is attributable to the increase in garbage grinders, particularly in commercial establishments, and to the fact that the District puts garbage in the sewers during summer periods when the incinerators are overloaded. If the assumed overall figure of 0.23 pound of BOD per person daily is exceeded in the future the dates when higher degrees of treatment are required to hold the BOD load on the River to 120,000 pounds daily will be somewhat earlier than anticipated here.

The rescheduling of treatment by each of the various political subdivisions of the area here considered desirable on the basis of new population forecasts is as follows:

The District of Columbia, which treats Maryland sewage as well as its own at the Blue Plains Plant opposite Alexandria, will complete the first stage of an aeration plant in 1958 at an estimated cost of $7,715,000. Additional aeration tanks and settling tanks will be added prior to 1960 at a cost of $5,147,000. The third stage, tentatively scheduled for 1965 and consisting of more aeration and settling tanks plus other improvements will cost about $5,005,000. The basic elements of the plant are designed to provide 80 percent BOD removal for a summer sewage flow of 290 million gallons daily from a tributary population of 1,791,000 expected in 1980. According to estimates used in this study, the latter population load may be reached shortly after 1970. When the District has completed construction of the works now planned, it should proceed at once with the engineering studies and design for further enlargements to go under construction by 1970. These enlargements should be designed for a further growth of the tributary population to 2,500,000 by 2000 A.D. If the treated effluent is to be discharged at Blue Plains in the future, as it is at present, then a higher degree of treatment also will be required.

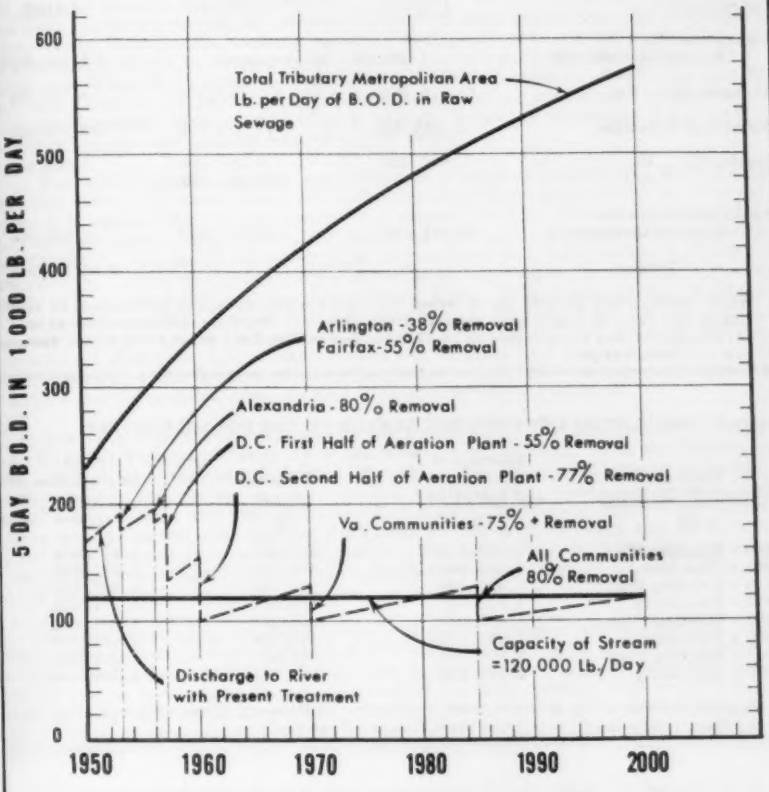
The Arlington County Sewage Disposal Plant, built in 1953 on Four Mile Run just southwest of the National Airport, provides plain settling and chlorination for sewage from a population of about 200,000 people. Present plans call for increased treatment and plant enlargements in 1970 and 1985 at estimated costs of $3,300,000 and $1,200,000 respectively. The date 1970 was estimated to be the time when the total load on the River would again exceed the limiting BOD of 120,000 pounds per day. It was assumed that prior to that time removal of 77 percent of BOD from the relatively much greater quantities of sewage treated at Blue Plains would make it unnecessary to provide a high degree of treatment by Arlington County until 1970. Although earlier installation of a complete treatment plant in Arlington County would be desirable on esthetic grounds, there is probably no urgent reason for doing this.

Treatment plants for both Alexandria and Fairfax County sewage lie on the north and south sides of Hunting Creek below Old Alexandria. Alexandria's new plant now provides 80 percent BOD removal, and Fairfax County's, 50 percent. If their effluents continue to be discharged to the Potomac River, these communities along with the District of Columbia and Arlington County should be prepared to go to a higher degree of treatment by 1970. Thereafter, all communities should provide the same amount of treatment.

Additions to the sewage treatment facilities must be coordinated with other measures to improve the Potomac River. If, as will be proposed in this report, the bulk of the sewage treatment plant effluents are discharged into Chesapeake Bay, increased levels of treatment might not be required. On the other hand, if the Potomac River continues to receive all of the treated sewage from the Washington Metropolitan Area, the levels of treatment ultimately needed must be judged from experience acquired as the amount and character of the pollutional load upon the River changes.

5-DAY B.O.D. IN 1,000 LB. PER DAY

FIG. 5



B.O.D. DISCHARGED TO POTOMAC RIVER UNDER PRESENT AND PROPOSED PROGRAMS

AFTER ALEXANDER POTTER ASSOCIATES AND GREELEY & HANSON

Table 6 - CURRENT POLLUTION ABATEMENT PROGRAMS -- WASHINGTON METROPOLITAN AREA[6/]

Jurisdiction	Expenditures 1950-1960 only		
	1950-55	1955-60	Total
Alexandria, Va., Sanitation Authority	(Work in progress)		$ 8,546,500**
Arlington Co., Va.	$3,610,000	$ 1,095,500	4,705,500
District of Columbia	6,059,000	17,911,000	23,970,000
Fairfax Co., Va.	1,500,000	2,200,000 (16,300,000)*	3,700,000
Washington Suburban Sanitary Commission	4,264,000	13,037,000	17,301,000
Total			$ 58,223,000

* While much of this (larger figure which includes sewers for areas now served by septic tanks) will remove septic tank seepage from streams, etc., figure is not used in total.
** $2,800,000 of this expenditure to be reimbursed by Fairfax County from future revenues are not listed herein.

Table 7 - POPULATION CONTRIBUTING SEWAGE TO THE POTOMAC RIVER*

Year and Source of Estimate	District of Columbia and Maryland	Virginia Areas	Total Metropolitan Area
(1)	(2)	(3)	(4)
1960 - Existing Plan	1,245,000	432,000	1,677,000
1960 - This Study	1,440,000	441,000	1,881,000
1970 - Existing Plan	1,430,000	507,500	1,937,500
1970 - This Study	1,712,000	559,000	2,271,000
1980 - Existing Plan	1,520,000	563,200	2,083,200
1980 - This Study	1,945,000	683,000	2,628,000
2000 - Existing Plan	1,700,000	651,600	2,351,600
2000 - This Study	2,315,000	890,000	3,205,000

* Figures for this study do not include populations in Patuxent River drainage area nor in drainage areas down river from Oxon Run and Cameron Run.

Table 8 - OVER-ALL DEGREE OF SEWAGE TREATMENT REQUIRED FOR SEWAGE EFFLUENT LOADING OF 120,000 POUNDS PER DAY

Year	Recommended degree of treatment under existing plan	Degree of treatment indicated by this study
1960	64	72
1970	71	77
1980	75	80
2000	80	84

SEPARATION OF THE COMBINED SYSTEM

Construction of the District of Columbia Sewerage System was begun in 1871 when treating sewage was not generally practiced. As was universal practice in those days, sanitary wastes and storm water were discharged to a single system of drains. When the need for treating sanitary sewage became apparent, the idea of dual systems, one for sanitary wastes and one for storm water, developed. The earlier type drains then came to be known as combined sewers. Somewhat less than one-half the area of the District of Columbia is served by combined sewers that formerly discharged sewage and, when it rained, mixtures of sewage and storm water directly into the nearest waterfront or creek.

The discharge of undiluted and untreated sewage to neighboring watercourses during dry weather created such foul conditions that interceptors were built to collect the dry weather flow for discharge to a larger river or at a more distant place. Since, during heavy rains, the flow of storm water may be 50 times the dry weather flow of sanitary sewage, it is impractical to intercept and carry away all of the combined sewage. Sanitary interceptors are designed, therefore, to take from the combined sewers some multiple of the dry weather flow. This is now usually 5 to 7 times the average dry weather flow or 2 to 3 times the peak dry weather flow. All combined sewage in excess of this amount discharges through the old outlets. During light rains all of the sewage is intercepted, but in rains that produce much surface flow, a mixture of untreated sanitary sewage and storm water escapes through the old outlets that have since come to be called storm water overflows.

The 70 storm water overflows in the District of Columbia discharge as follows: 12 to the Potomac River, 13 to the Washington Channel, 18 to the Anacostia River, 23 to Rock Creek and 4 to Piney Branch. In a few cases, where the older interceptors are now unable to carry the dry weather flow, some raw sewage is discharged more or less continuously. In other cases, the mechanisms which admit sanitary sewage to the interceptors stick shut or fail in other ways and all the dry weather flow escapes through the old outlet. The latter type of difficulty, which was frequent some years ago, has now been diminished by a program of regular inspection and maintenance.

Fortunately, when interceptors are properly designed and maintained, the sanitary sewage that escapes through storm water overflows is a relatively small part of the total annual amount. It has been estimated that no more than two percent of the District's sanitary sewage is discharged annually through storm water overflows. These discharges, however, come in sudden bursts, as do the rains. For short periods, the overflowing storm water may carry four-fifths or more of the sanitary wastes from areas served by combined sewers.

Intermittent discharges of large amounts of raw sanitary sewage make it almost impossible to provide continuously throughout the water areas of Washington a degree of cleanliness that would make swimming safe everywhere. A plan is described later which would make the Potomac safe for swimming above the 14th Street bridges. Possibly during periods of infrequent or slight rainfall, other areas may be temporarily safe if some of the measures described below are adopted.

Much study has been given to the idea of converting areas now served by combined sewers to the separate system. The magnitude of this task is staggering. It requires building a complete new set of sewers which would cause interminable inconvenience to street traffic. It requires separation of roof and yard drainage from sanitary sewage on every property in this area. If a new sanitary system were built, each building would require a new street connection. It is exceedingly difficult to keep sanitary sewage out of storm drains and storm water out of sanitary sewers in cities that have always had separate systems. It is difficult to believe that perfect separation could be attained in areas once served by combined sewers.

The direct cost of changing all areas of the District of Columbia to the separate system has been estimated[10/] to be $238,000,000, in addition to an expenditure of $62,000,000 for relief sewers. Such an undertaking would entail many indirect costs. Interruption and delay of traffic and loss of business along streets in which the new sewers were being built would be objectionable and might cause financial hardship for many people.

In spite of the cost and the inconvenience, the District of Columbia hopes to proceed slowly with conversion to the separate system in areas where the overflows are particularly objectionable and where, because the drainage areas are small and border the River, the new storm water sewers need not be large. The recent report on improvements to the sewerage system[10/] favors a plan which involves changing four areas to the separate system (See Figure 1). These are: (a) the area bounded on the southwest by the Tidal Basin and Washington Channel and the north and east by Constitution Avenue, Canal Street and New Jersey Avenue; (b) a small area east of the Anacostia River and south of Pennsylvania Avenue which has the only combined sewers in that part of the District lying east of the Anacostia and Potomac Rivers; (c) a small area near Watergate and (d) the Foundry Branch and College Pond drainage areas west of and south of Wisconsin Avenue in Georgetown. It is estimated that this conversion work will cost $11,284,000 and will require 13 years to complete.

In other combined sewer districts, complete separation should be provided as a part of all redevelopment projects that involve demolition and reconstruction of buildings in large portions of the old City. These separate systems for some years may have to be discharged into existing combined sewers. However, as the slum areas of Washington are gradually rebuilt, a time will come when the sewers in these individual areas can be integrated into a more completely separate system.

The number and volume of sewage contaminated storm water overflows can be reduced by constructing large interceptor and relief sewers. Examination of the possibilities in this direction was the main purpose of the recent Board of Engineers Report on Improvements to Sewerage System.[10/] The project recommended by the Board would involve an expenditure of $122,000,000 for relief sewers, interceptors and pumping stations, the purposes of which would be to relieve flooding and to reduce the escape of sanitary sewage into the creeks and rivers in the District of Columbia. Some of the work proposed by the Board of Engineers will be discussed in connection with a review of the future needs for interceptors and relief sewers throughout the entire Washington Metropolitan Area.

INTERCEPTORS AND RELIEF SEWERS

"Interceptors" and the "relief sewers" which parallel them and provide additional interceptor capacity, collect sewage from the drainage areas along the Potomac and Anacostia Rivers and transport it toward the treatment plants. The sewage collected may be either sanitary sewage or combined sewage or both. "Trunk sewers" deliver sewage from the sub-areas to the interceptors. "Outfall sewers" take sewage from a group of interceptors down to the treatment site or point of disposal. In some cases the sewers leading down the sub-drainage areas are called interceptors rather than trunk sewers. The Rock Creek and Cameron Run interceptors are examples of this.

Since the population estimates adopted for this study exceed by a considerable margin those used in earlier reports on sewerage it is desirable again to check the capacity of existing and proposed interceptors and relief sewers. The present review involves three assumptions which, if proved incorrect by the course of future events, will alter the figures presented in the following discussion.

The first assumption is that all Potomac Basin sewage originating in the Washington Metropolitan drainage areas down to and including the Oxon Run and Cameron Run areas will ultimately be treated either at Blue Plains Sewage Plant or at one of the plants in the vicinity of Alexandria, Virginia, across the River. This assumption requires that sewage from the Great Seneca Creek area in Montgomery County, Maryland and from the Potomac watershed area in Fairfax County, Virginia, up the River from Arlington County, all be carried to the existing plant sites for treatment. It is recognized that there may need to be constructed at first, in these and other upstream areas, small plants to treat the sewage from communities where intensive local development precedes general development of the entire area. Such plants should be abandoned when it becomes economically practicable to construct the interceptors necessary to transport all sewage downriver.

In the future, Washington will draw its water supply at times from the River near Little Falls. The location of sewage plants at no great distance above the water intake would involve unwarranted health hazards. Perhaps such sewage plants, discharging well chlorinated effluents, might afford adequate protection most of the time. However, all sewage treatment plants become overloaded or break down. When this occurs, relatively fresh sewage pollution is discharged, which in Washington could easily be carried to the water supply intake.

The second assumption is that most of the sewage from the Potomac-Fairfax County area, and from Loudoun County, should it become urbanized, will ultimately be carried across the Potomac River above Great Falls and sent down the Maryland side of the River to the Blue Plains plant. Although economic comparisons between this scheme and alternate ones have not been made, the severe difficulty of building a large interceptor down the Virginia side of the Potomac gorge or of pumping the sewage over the numerous divides in Virginia, strongly suggests that carrying upstream Virginia sewage across the River may be the most practicable plan.

The third assumption is that the discharge of combined sewage into the Potomac River above the mouth of Rock Creek should be prevented during all rain storms, except those of unusual magnitude. The accomplishment of this is an

essential part of the plan presented herein for the recreational development and beautification of the Potomac estuary above the 14th Street bridges.

The systems of trunk sewers, interceptors, outfalls and their accompanying relief sewers have become very complex. Construction of the works recommended in the 1957 Report of the Board of Engineers will add to this complexity. Therefore, the present discussion will be confined to those large sewers, which in the light of the new population estimates or of the assumptions above, will need to be built or relieved in the next few decades.

The Upper Potomac Interceptors

The Upper Potomac Interceptor now follows the Maryland and District of Columbia side of the Potomac River from Cabin John Creek down to the mouth of Rock Creek. This interceptor will be extended by stages, as the Metropolitan area grows, until it reaches upstream at least as far as Great Seneca Creek. As mentioned earlier it may be called upon to carry sewage brought across the River from Fairfax County, Virginia. During rains this interceptor receives some surface water through the combined systems in Georgetown.

Using the data in Table 3, future flows in the Upper Potomac Interceptor and its relief sewers have been estimated and are shown in Table 9. Calculations of peak sanitary sewage flows down to the combined sewers in Georgetown have been based on Gift's curve, Figure 4. Additions from the combined sewers have been assumed to be 30 times the estimated average annual flow of sanitary sewage in these sewers.

The Board of Engineers has recommended construction of an Upper Potomac Interceptor Relief that would extend from Rock Creek up to the District line. The combined capacity of the present interceptor and the proposed relief would be 33.6 mgd at the District line and 123.6 mgd at the mouth of Rock Creek. If the future development is as assumed here, upstream portions of the proposed relief will become inadequate about 1975 and downstream portions about 1990.

Each succeeding sewer constructed along a watercourse becomes more difficult to locate and more expensive to build. It is suggested, therefore, that the capacity of the proposed Upper Potomac Interceptor relief be carefully re-examined on the basis of the latest population data and that it be designed to serve the re-estimated needs at least as far into the future as the year 2000. In our opinion the combined capacities of the present Upper Potomac Interceptor and its relief should range from not less than 112 mgd at the District line to not less than 166.7 mgd at the Rock Creek end. If the addition of another relief in the year 2000 would be exceedingly difficult and costly it might be wise to provide for flows that will develop in the more distant future.

The latter comment applies also to the design of Upper Potomac Interceptor extensions and reliefs in Maryland. The times when extensions and reliefs will be needed in Maryland are estimated to be as follows:

1970 - (1) Extension of the Relief up to Cabin John Creek.

(2) Extension of the Interceptor to a point where Fairfax County sewage can be brought across the River.

1980 - Extension of the Interceptor to Watts Branch.

1990 - Extension of the Interceptor to Muddy Branch and Seneca Creek.

Other Interceptors in the District of Columbia and Maryland

Insofar as other interceptors and relief works in the District of Columbia are concerned, the program recommended by the Board of Engineers is ample. The schedule of expenditures prepared by the Board of Engineers, including the $11,284,000 for conversion of three areas to the separate system, is as follows:

Period	Expenditures
1958 - 1960	$ 10,410,000
1961 - 1963	41,331,000
1964 - 1966	38,143,000
1967 - 1969	24,580,000
1970 - 1972	18,710,000
	$133,174,000

All of this work is needed in order to make progress in cleaning up the Potomac River. In fact, if much of it is not built, the amount of untreated sewage reaching the River through storm water overflows and other relief outlets will go on increasing as the capacities of existing interceptors continue to be more heavily taxed.

The amount of Maryland sewage delivered to the District of Columbia Outfall Sewer via the Anacostia River Trunk Sewer is expected to reach 99 mgd in 1970 and 164 mgd in 2000. Since available sewer capacity down to the District line is 90 mgd, a relief sewer may be needed in Maryland before 1970. Inside the District the Maryland sewage is now being discharged into the Anacostia Main Interceptor. The Washington Suburban Sanitary District, in 1958, will extend its Anacostia River Trunk Sewer on down the east side of the Anacostia to a connection with the District of Columbia Outfall Sewers. This will relieve the Anacostia Main Interceptor so it may adequately serve the District of Columbia areas for which it was designed.

Arlington County Interceptors

Arlington County has a completely separate sewerage system. Storm drains carry the surface runoff directly to outlets along the Potomac River and two interceptors convey sanitary sewage to the treatment plant on Four Mile Run.

The Potomac Interceptor, which follows the Virginia bank of the River, collects sewage from the Potomac-Arlington drainage area. This area includes a group of small tributary basins lying along the Potomac River north of the Four Mile Run watershed. It is anticipated that by 1975 this interceptor should be extended outside the boundaries of Arlington County to serve the Upper Pimmit-Dead Run area and also portions of the Fairfax County area that drain naturally into the Potomac gorge. The capacity of the Potomac Interceptor at the treatment plant should be as follows:

Table 9 - ESTIMATED FLOWS IN THE UPPER POTOMAC INTERCEPTOR AND ITS RELIEF SEWERS

Year	Drainage Basins Served	Peak flow after addition of sewage from each area, MGD
(1)	(2)	(3)
1960	Cabin John Creek (Md)	12.2
	Little Falls Branch (Md)	18.6
	Upper Potomac (D.C.)	43.1
1970	Potomac-Fairfax (Va)	6.7
	Cabin John Creek (Md)	22.8
	Little Falls Branch (Md)	29.4
	Upper Potomac (D.C.)	58.1
1980	Watts Branch (Md)	10.8
	Potomac-Fairfax (Va)	26.6
	Cabin John Creek (Md)	47.5
	Little Falls Branch (Md)	54.0
	Upper Potomac (D.C.)	89.0
2000	Seneca Creek (Md)	18.2
	Muddy Branch (Md)	28.6
	Watts Branch (Md)	43.2
	Potomac-Fairfax (Va)	77.0
	Cabin John Creek (Md)	112.0
	Little Falls Branch (Md)	121.8
	Upper Potomac (D.C.)	166.6

Date	Capacity, mgd
1960	19.4
1970	22.1
1980	32.8
2000	45.2

Since the present terminal capacity of the Potomac Interceptor is 24 mgd, it is apparent that an interceptor relief sewer will be required in Arlington County about 1975.

The second interceptor serves that part of the Four Mile Run drainage basin within Arlington County and also carries some sewage from areas in Alexandria and Fairfax County. Arlington County plans to build a Four Mile Run Interceptor Relief which will be adequate to the year 2000.

Alexandria Interceptors

There are three drainage areas within the City of Alexandria. The Potomac-Alexandria area has combined sewers which discharge about four times the average dry weather flow into the City's Potomac Interceptor. The present 19 mgd capacity of this interceptor may need to be increased to about 25 mgd by construction of a relief sewer in 1985.

The Commonwealth Interceptor serves the Hooff's Run area, about five percent of which has combined sewers. Alexandria's Holmes Run Trunk Sewer collects sanitary sewage from the Holmes-Cameron Run area in Alexandria and is designed to receive through two metered connections up to 57.7 mgd of Fairfax County sewage. These sewers will be adequate to the year 2000.

Fairfax County Interceptors and Trunk Sewers

Fairfax County has before it the enormous job of building sewers for a developing urban and suburban area stretching from 7 miles above Great Falls down to Occoquan Creek 15 miles below Alexandria. The exact form this system will take is uncertain at present. Topographic considerations suggest that the area along the Potomac above Great Falls can be serviced most economically by carrying the collected sewage across the Potomac River to the Upper Potomac Interceptor in Maryland. From Great Falls down to Arlington County, development ought to be limited to large acreage lots unless it becomes possible to build the interceptors, pumping stations and force mains necessary to carry sewage from this area to the Arlington Potomac Interceptor.

The Cameron Run area is now served by a trunk sewer from which 57.7 mgd can be by-passed to Alexandria's Holmes Run Sewer and 12 mgd can be carried to the Fairfax County Sewage Treatment Plant on the south side of Hunting Creek. Predicted peak flows from the Cameron Run area are as follows:

Year	Peak flow, mgd
1960	28.6
1970	43.5
1980	56.4
2000	81.0

The total carrying capacity of the by-passes to Alexandria's treatment plant plus the capacity of the sewer to the Fairfax plant will be exceeded sometime around 1990. The Holmes Run and Back Lick Trunk sewers above the by-passes will need relief about 1970.

Each Fairfax County drainage area down the Potomac River from Hunting Creek will someday have a trunk sewer leading either to its own treatment plant or to an interceptor which carries sewage to plants that serve more than a single drainage basin. The decisions as to the best solution will have to await completion of detailed engineering studies. These should not be delayed too long, for the area is growing rapidly and first measures should fit properly into an overall plan for the development of the sewerage system.

In the absence of detailed engineering studies it is difficult to estimate the total amount of money that must be expended in the next few decades for trunk sewers, interceptors, reliefs, pumping stations and other major sewage collection projects in the Washington Metropolitan Area. The Board of Engineers' estimate of $133,000,000 for works needed in the District of Columbia represents perhaps not more than half the total for all political subdivisions of the Metropolitan Area. This would not cover the cost of street and lateral sewers in new subdivisions. Most of the collection works cannot be considered parts of a pollution abatement program. Their construction creates the need for sewage treatment plants and other disposal facilities. However, the cost of sewage collection on the one hand and sewage disposal on the other, constitute the total price of handling the sewage of a great metropolitan area. The problem of financing one part of the job cannot be considered apart from the need for financing the other.

Figure 6.

Charles River Basin today

Charles River flats – 1902

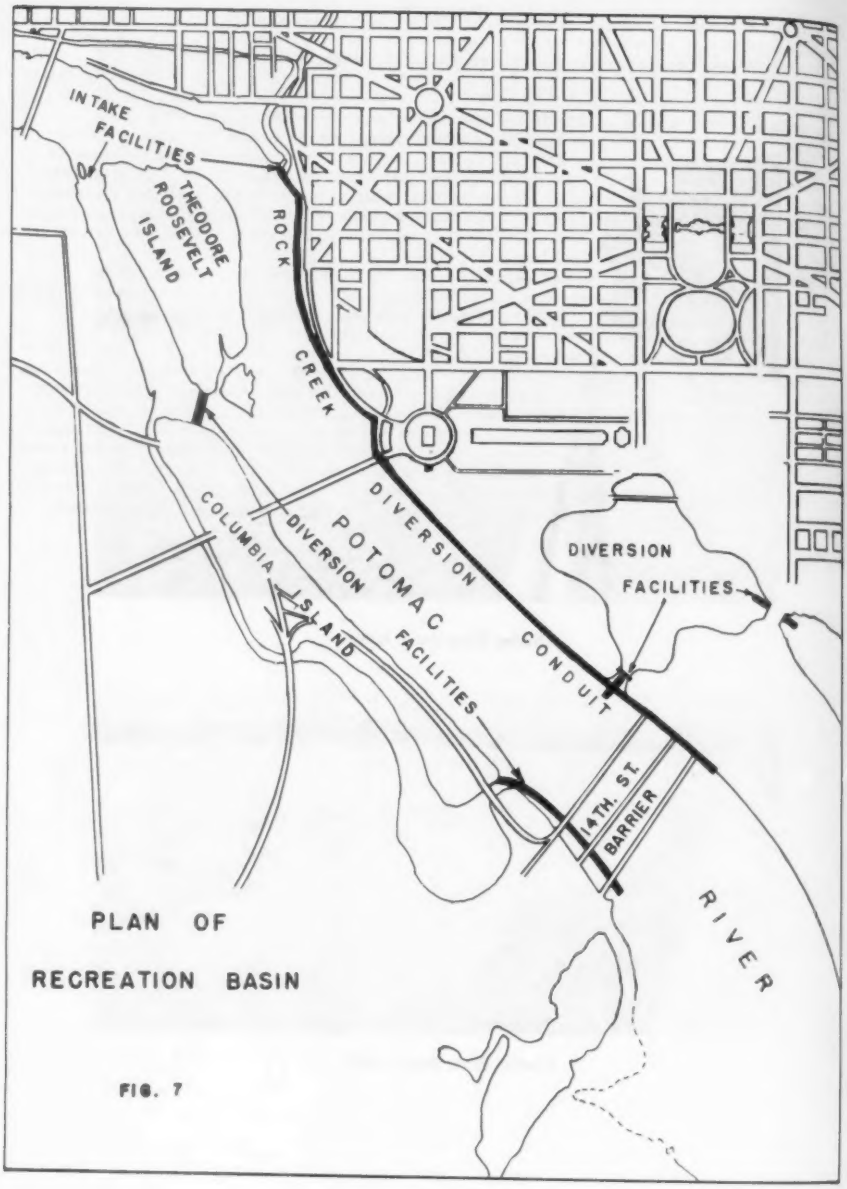

INTAKE FACILITIES
THEODORE ROOSEVELT ISLAND
ROCK CREEK
DIVERSION
POTOMAC
DIVERSION FACILITIES
CONDUIT
COLUMBIA ISLAND
DIVERSION FACILITIES
14TH. ST. BARRIER
RIVER
PLAN OF RECREATION BASIN

FIG. 7

A WATER RECREATION BASIN

The people living in Washington are primarily interested in making the Potomac River safe and enjoyable for recreation and water sports. Costly pollution abatement programs that did not accomplish this would result in public disappointment and might raise doubts that the great expenditures were worth while.

Not all of the water areas of the Potomac estuary can be made safe for swimming. Storm water overflows, sewage from boats, treated municipal sewage, surface drainage from the City and the scattering of all these by the tides are formidable obstacles. Although it will be possible so to improve the entire estuary that game fish will return and boating will be a pleasure, only a part of the River can be recovered for all recreational uses.

A clean water area can be obtained by building a barrier against the tides and diverting storm overflows and surface drainage to points downstream from the barrier. The water level above the barrier could be held constant and the basin freshened and flushed by upstream releases of clean water. The location that appears best for a barrier is somewhere in the vicinity of the 14th Street bridges. A barrier here would create a reasonably large recreation basin without requiring too great an expenditure for diversion works to by-pass storm overflows and surface runoff.

With the barrier at 14th Street, clean water could be passed through the present Tidal Basin and back to the River through Washington Channel. The Tidal Basin would no longer fluctuate. Its dirty, polluted appearance would be changed by the clearer water from the Riverbend Reservoir upstream. Washington Channel would still rise and fall with the tides, but it would now be flushed by a steady flow of clean water at its upper end.

The major expense connected with the development of a recreation basin above 14th Street, would be the construction of a conduit to divert Rock Creek and the overflows of combined sewage. The conduit could follow the shore of Potomac Park. Its broad concrete top, placed a foot or so above the fixed level of the Basin, would provide abundant access for recreation and would offer also great opportunity for beautifying the waterfront of Washington's monumental parks. It could have docks and swimming areas. It could be fitted with balustrades and benches and be a promenade reached by wide stairways. Imaginative architectural planning could make this waterfront in the heart of Washington one of the most beautiful in the world. And the water before it also would be beautiful and clean and safe for all types of recreation.

The Charles River Basin

The desirability of constructing a dam on the lower Charles River between Boston and Cambridge, Massachusetts, for the purpose of creating a recreational water park of relatively constant level was first recognized and advocated in 1859. It was in 1901 that the Governor of Massachusetts appointed a special committee to study the feasibility of such a dam. The committee recommended in favor of the project stating that, "as this basin is to be used for park purposes, it is essential

that the condition of the water should not only be harmless to health, but also that there should be no suggestion of sewage - - -".[12] The dam, with navigation locks, was authorized and constructed in 1908 at a cost of approximately four million dollars. This is equivalent to a cost of about $30,000,000 at today's prices. In 1929, it was said that the Charles River Basin was, "- - - a water park of great beauty. It now affords health, comfort and enjoyment to thousands of people - - -."[12]

The dam, which consists of earth fill inside of masonry retaining walls, is 1200 feet long and from 100 to 500 feet wide. There is a lock for large boats on the Boston side and one for smaller boats on the Cambridge side. Eight sluice gates are provided, the bottoms of which are about 10 feet below the surface. The dam creates an impoundment, called the Charles River Basin, which is 8.5 miles long and varies from 150 to 400 feet in width in the upper six miles. The maximum width in the lower 2.5 miles is 2300 feet. Average depths range from 15 feet at the dam to 3 feet in the upper reach. The basin surface area is estimated at 706 acres and the storage volume at 3.42 billion gallons. Pool level, or mean storage level, in the Basin is about 2 feet above mean tide.

Although there are no upstream reservoirs of any consequence for moderating flood flows, studies indicated that flood flows would produce a maximum rise in the Basin of only two feet. Since the effective drainage area is only 66.2 square miles, there is a problem resulting from low flows: "- - - during the summer months the flow in the Charles River entering the Basin for a week at a time may not exceed 5 cfs - - - something further must be done to conserve the flow of this stream by acquiring water rights - - -, or by the construction of storage reservoirs if sanitary conditions in the Charles River Basin are to be maintained. Under present conditions of low flow in the river it is necessary to introduce tidewater, at times, to maintain the water in the basin at a proper elevation."[12]

The Charles River Basin has been used for a wide variety of recreational pursuits, which in the past included swimming. Combined sewage interceptors along the banks of the basin overflow to the watercourse and while this has caused no serious problem from an oxygen balance point of view, bacterial counts have risen to unsatisfactory levels. For example, the Massachusetts Department of Public Health, in 1933, found coliform densities of 100 to 55,000 per 100 ml at bathing points. Sewage pollution from overflows has increased to the point that swimming in the Charles River Basin has had to be abandoned. It is now considered more economical to build public pools than to reduce the bacterial contamination of the Basin.

Nearly fifty years of experience with the Charles River Basin Project have confirmed the wisdom of the imaginative planning which resulted in the beautification and extensive recreational use of what was once an unsightly, polluted tidal stream.

The 14th Street Barrier

For the purposes of this report, the pool created by the construction of a barrier at or near the 14th Street bridges will be known as the Washington Recreation Basin.

The requirements of the proposed barrier are:

1. It should maintain a relatively constant upstream pool at the elevation of the maximum annual high tides.

2. It must be capable of maintaining a maximum water level differential of 6.5 feet at times of exceptionally low tide below the barrier.

3. It must pass future moderated flood flows without appreciably increasing the rise in water level that would have occurred without the barrier.

4. It should contain a lock structure to accommodate pleasure craft movements and handle limited commercial shipping.

With reference to the second requirement, the normal tidal range is approximately three feet with an average period of 740 minutes. Average annual maximum range is about 3.5 feet. Allowing for 0.5 feet surcharge, the level of the Recreation Basin could stand at 4 feet above mean low tide when, due to negative wind tide, the water level below the barrier was 2.5 feet below mean low tide. Thus the maximum difference in water elevation with the barrier gates unopened would be 6.5 feet.

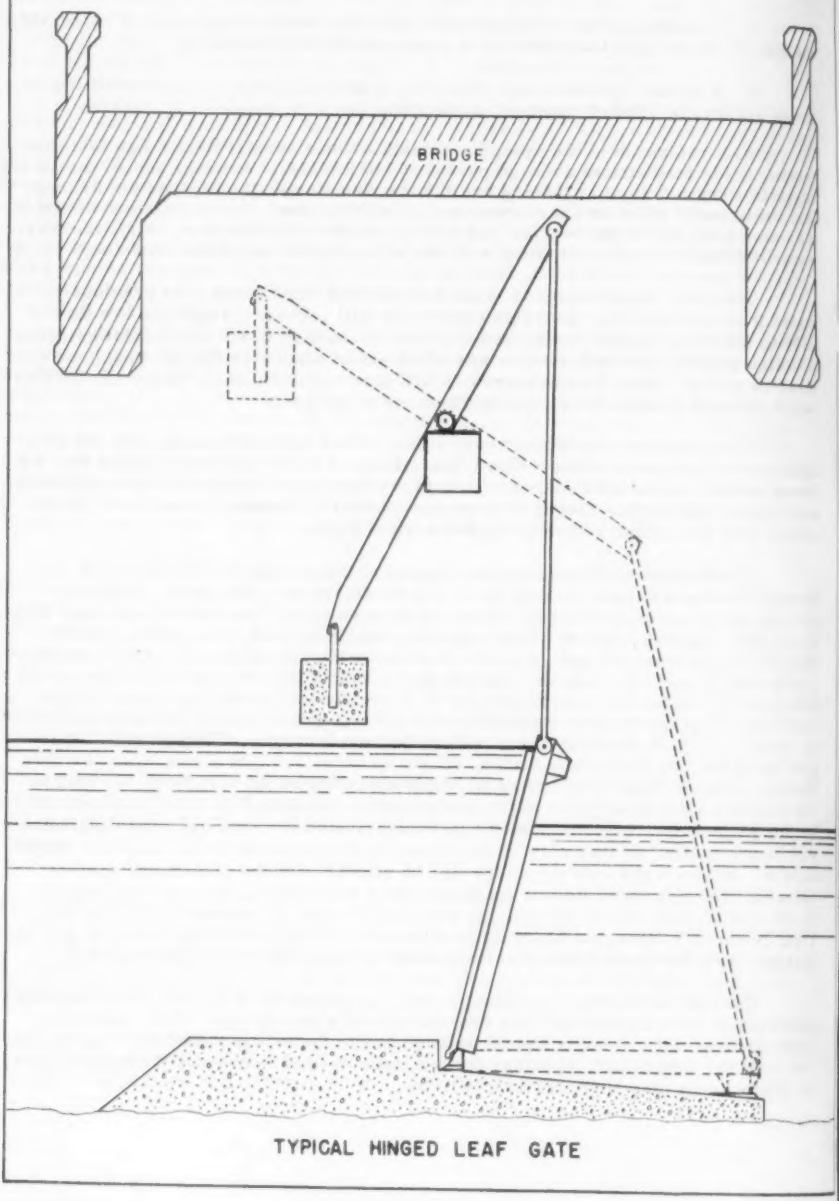
The third requirement is to pass moderated flood flows. As previously stated it is assumed that upstream reservoirs will provide a regulated low flow of 3500 to 4000 cfs, needed for operation of the Recreation Basin and for downstream pollution control, and will remove silt which would otherwise fill the Basin and destroy its value. Since these reservoirs will also moderate flood flows, the barrier would not need to pass floods similar to those of the past.

With regard to the fourth requirement, there are two reasons why the lock need not be an elaborate one. First, the volume of water commerce above the 14th Street bridges is low and is for the most part restricted to rather modest petroleum and gravel shipments. Second, the encouragement of commerce would not be consistent with the primary uses of the Recreation Basin.

The barrier could be a series of gates, hinged along the bottom edge, and installed between existing bridge piers at 14th Street or, preferably, integrated into the design of the new bridge which, it is understood, may be erected near 14th Street (See Figures 7 and 8). If the existing bridge is used, gate widths will be dictated by present pier spacings, but if a new bridge is authorized, pier spacings may be made to conform to an optimum gate width. These hinged-leaf gates would fold over and lie on the bottom parallel to the water surface during flood stages. Upstream rotation would be restricted to a normal operating angle of 15 degrees off the vertical. Gate rotation, then, will be through an angle of 75 degrees. Mean pool elevation, as previously stated, should be about 3.5 feet above mean low tide. Hence, under average conditions, tailwater elevation would vary from 3.5 feet below pool elevation to 0.5 feet below pool elevation at mean high tide. It is possible for the gates to be counterweighted and float-actuated so that flood stage operation will be automatic, or they may be mechanically lowered and raised as river stages dictate. No doubt the lock structure will be aligned with the existing navigation channel. The regulated flow of the River could be released from the Recreation Basin through four exits: by spillage over the barrier; by diversion through the Tidal Basin to Washington Channel; by diversion through Boundary Channel, and by passage down the Rock Creek diversion conduit described later (See Figure 7).

Cost of the barrier, including a lock, is estimated at $8,000,000 if barrier construction is integrated into the construction of a new bridge. Pier costs and some other structural costs should be allocated to the bridge rather than to the barrier. On the other hand, if bridge piers cannot be used to support the hinged gates, the project cost may approach $13,000,000.

FIG. 8



TYPICAL HINGED LEAF GATE

These costs for the barrier project, however, will not represent the only expenditures necessary to assure a Recreation Basin containing clean water. Pollution sources would still exist upstream from the barier and, if disregarded, would degrade the basin to a significant extent. Several combined sewers overflow upstream from 14th Street. These should not be permitted to discharge into the proposed Recreation Basin. Rock Creek contributes an appreciable quantity of silt as well as some combined sewage overflows to the Potomac River. Arlington County discharges silt-laden storm water to the Potomac and finally, the Pentagon sewage treatment plant adds an organic load to Boundary Channel. Methods for preventing pollution from these sources are described below.

Preventing Pollution above the Barrier

A system of interceptors of sufficient capacity to carry to the treatment plants all sanitary sewage from the metropolitan drainage areas above 14th Street, is the first requirement for maintaining clean water in the Recreation Basin. These interceptors have been discussed in the preceding section. Other works that will be required are as follows: (1) a diversion conduit to carry all storm water overflows between Georgetown and 14th Street and most of the silt laden flood flows from Rock Creek to a point below the barrier, (2) control works for this conduit, (3) control works for diversion through the Tidal Basin and Washington Channel, (4) arrangements for controlled diversion of water back of Roosevelt Island, down Boundary Channel, through the Pentagon Basin and out to the River below the Barrier (See Figure 7).

The Rock Creek Diversion Conduit

The Board of Engineers plan[10/] for improvements to the sewerage system of the District of Columbia involves among other things (a) the construction in Rock Creek Park of a very large relief sewer which would reduce the overflows of combined sewage into Rock Creek to a frequency of no more than once in two years, and (b) the construction of a pumping station, force main and outfall relief sewer which will make it possible to deliver an additional 760 cubic feet per second of combined sewage from the mouth of Rock Creek to the Blue Plains sewage treatment plant.

If these works were completed, there would be every year or so a maximum overflow of combined sewage of 1962 cubic feet per second at the mouth of Rock Creek, 980 cubic feet per second at the pumping station nearby, 710 cfs at the existing Easby Point (Watergate) overflow and 801 cfs from the proposed Easby Point overflow relief. The primary purpose of building the Rock Creek Diversion Conduit, proposed here, would be to carry these combined sewage overflows to a point below the barrier.

In order to reduce the overflow of combined sewage along the Potomac above Rock Creek, the capacity of the Upper Potomac Interceptor Relief proposed by the Board of Engineers, should be increased to 156 cfs at the District Line and 165 cfs at the mouth of Rock Creek. If this were done and the Rock Creek Diversion Conduit is built, combined sewage would overflow into the Recreation Basin only infrequently, and then in small amounts. A part of this overflow would be direct to the Basin along the Georgetown waterfront. It would equal the amount by which the flow in Georgetown combined sewers exceeded the available part of the 258 cubic feet per second total capacity suggested for the Upper Potomac Interceptor and its

relief. Other combined sewage would enter via Rock Creek from relief sewers expected to overflow about once every two years.

In order to reduce the frequency and the amount of combined sewage reaching the Recreation Basin and to keep out a substantial portion of Rock Creek silt, the Diversion Conduit should accept modest flood flows from Rock Creek itself as well as all the combined sewage overflows near its mouth.

Streamflow records for the Sherrill Drive gaging station just above the District Line, where the drainage area is 62 square miles, show the following flows for the period from October 1929 to September 1956: maximum recorded flow 7220 cfs; minimum recorded flow 0.5 cfs; average of annual maximum flows 2011 cfs; average annual minimum flows 7.3 cfs. There were twelve days during the 24 year period (1929-1953) when the daily discharge exceeded 1000 cfs, three days in the spring, five in the summer and four in the fall.

There are twenty square miles between the gage and the mouth of Rock Creek. About 12 square miles of this area will be drained by combined sewers and the interceptors and reliefs into which they discharge. In view of the fact that diversion of 1962 cfs from these sewers would be provided for, it is judged that provision for not less than an additional 1000 cfs from Rock Creek would give adequate protection of the Recreation Basin. One reason for assuming a figure no higher than 1000 cfs is because the Rock Creek basin is long and narrow and the sewered area having high runoff rates is near its mouth; there is not much likelihood that peak flows will arrive from the upper or County part of the area at the same time the lower or District part of the area is discharging runoff at peak rates. However, further study may indicate that it would be desirable to divert more than 1000 cfs from Rock Creek when the relief and combined sewers are overflowing.

Enlargement of the Upper Potomac Interceptor Relief, beyond the capacity recommended by the Board,[10/] will produce an additional overflow of 67 cfs at the mouth of Rock Creek. This overflow would be received by the Rock Creek Diversion Conduit.

The Rock Creek Diversion conduit would be a gravity flow, rectangular, enclosed structure running along the District shore of the Potomac from the mouth of Rock Creek to just below the barrier. It would be constructed in the river and would be vertically partitioned to form dual conduits. A design discharge of 3029 cfs, under the critical high tide condition, in the upper 2400 feet from Rock Creek to the proposed Potomac River Sewage Pumping Station (1962 cfs from the overflow sewer, 67 cfs from the suggested Upper Potomac River Interceptor overflow and 1000 cfs from Rock Creek itself) would suggest dual conduits each about 27 feet in width and 12 feet in height. The next 1200 feet from the pumping station to the existing Easby Point overflow, carrying an additional 980 cfs overflow from the pumping station, might have dual channels each 30 feet in width and 13 feet in height. An allowance of 710 cfs from the existing Easby Point overflow would indicate that the next 3400 feet of the conduit should have dual channels each 32 feet in width and 14 feet in height. The proposed Easby Point overflow Relief would add 801 cfs and the terminal 3400 feet of the conduit, with a capacity of 5520 cfs, would have dual channels each 33.75 feet in width and 15 feet in height. The capacity of the conduits will vary with the tidal elevation below the barrier, ranging upward from the design discharge of 5520 cfs at high tide to 7800 cfs at low tide.

Proper operation of the conduit would necessitate provision for periodically admitting Potomac River water to the conduit, at the mouth of Rock Creek, to achieve scouring velocities. This is because the slope of the diversion conduit necessarily would be insufficient, except at large discharges, to prevent deposition of silt within the conduit. It would be possible, of course, to provide for continuous scour by admitting river water continuously during dry weather, but for the fact that the quantity of river water required would approach the order of magnitude of the regulated low water flow. Flow into the conduit would be on a preferential basis so that interceptor and relief sewer overflows always would be taken, with Rock Creek itself being diverted to the minimum extent of 1000 cfs in a two year storm. There thus would be by-pass facilities for Rock Creek directly into the Potomac River, but the by-passes would be infrequent and nearly innocuous. It is estimated that the Rock Creek Diversion Conduit can be constructed for $15,000,000.

The conduit, in addition to serving its primary task of water conveyance, would offer an extraordinary opportunity for building recreational facilities and beautifying the waterfront. The conduit roof-slab might vary in width up to about 75 feet and could be 1.5 to 2.0 feet above the mean pool elevation created by the barrier. To the casual observer who did not realize its primary function, the conduit would appear as a wide walkway, or promenade, extending along the Potomac River from Rock Creek to 14th Street and situated only slightly above the Potomac River, a clean Potomac having esthetic characteristics in marked contrast with those of the present River. This would be the type of river which residents of and visitors to the Washington Metropolitan Area should expect to find in the Potomac Park and the promenade would afford them an opportunity to be near the River and enjoy it. Besides being a place near which people can conveniently park their automobiles, they could stroll along the River. The promenade can have facilities for mooring pleasure craft, for fishing and for swimming.

Changes on the Virginia Side of the Potomac

Pollution from the Virginia side is caused principally by storm drainage discharges from Arlington County. As previously mentioned, these carry much less polluting materials than the combined sewage overflows which occur on the District side. Pollution is also caused by the discharge of effluent from secondary treatment at the Pentagon sewage treatment plant into Boundary Channel. Storm waters, even though not combined with domestic sewage, carry silt and miscellaneous debris which are to be regarded as esthetic contaminants. It is proposed that such discharges continue to be made into Boundary Channel. This channel could then be isolated from the main channel of the Potomac, excepting at its upper end, by providing a fixed barrier between the downstream end of Theodore Roosevelt Island and the upstream end of Columbia Island. Water would then be discharged from the Channel through the Pentagon lagoon to a point below the barrier. The latter might be done by placing sheet piling adjacent to the shore of the main channel. In addition, there should be facilities for regulating the flow in Boundary Channel, and some dredging and channel improvements to provide better flow characteristics (See Figure 7). It is estimated that the work required to divert Arlington County storm drainage and Pentagon secondary effluent below the barrier, will cost some $2,000,000.

Boating on Recreation Basin

In view of the cost of building the Recreation Basin and providing a lock, the question might be asked, "What use will be made of the Recreation Basin by pleasure

craft that now operate in areas below the 14th Street bridges?" Present patterns of recreational use give little or no indication of the future uses that will prevail if the Recreation Basin is constructed, for the proposed Basin may be more desirable for boating than any of the presently used downstream areas. This will probably be the case even though the downstream areas will be improved also by measures later described.

Protection of the Recreation Basin

The cleanliness of the Recreation Basin must be zealously guarded. As the upstream population increases in both Virginia and Maryland, interceptors must be provided to carry the sewage down the River for treatment and disposal. At first it will probably be necessary to tolerate small local plants on tributary streams above the barrier. These plants should be carefully planned and operated to provide the maximum protection to the Potomac River. Even though the capacity of the suggested Rock Creek Diversion Conduit is large, there would be on rare occasions some overflows of combined sewage and silt-laden water. These will be somewhat deleterious to the Recreation Basin, but further protection against them would probably cost more than benefits to be realized from the added protection.

Use of the Recreation Basin by pleasure craft will constitute a potential source of localized pollution. It is common for commercial vessels, as well as pleasure craft, to discharge raw sewage and garbage to the Potomac River and the total effect of such discharge is more significant than some imagine. In spite of the present importance of this problem, and it will become increasingly important as the trend toward more widespread ownership of pleasure craft continues, comparatively little attention has been directed toward developing a satisfactory solution. Part of the solution must be the attainment of a high degree of voluntary cooperation from boat owners, based upon public pride in a clean watercourse. Regulations would be difficult to enforce. Progress is being made in the development of sewage treatment and holding devices for pleasure craft, but only a few such devices are in use. Boats should not discharge sewage while in the Recreation Basin. They should be equipped with small holding tanks, or their toilets should be made inoperative. Pollution caused by boats operating below the barrier is discussed elsewhere.

Model Studies of the Estuary and the Basin

The Corps of Engineers has developed the art and science of hydraulic modeling to a level that now makes it possible to predict with reasonable accuracy the effect of physical alterations on the behavior of river estuaries. Studies of East River at New York, of the Delaware River from Trenton to the Delaware Bay, and of the Saint Johns River from above Jacksonville to the Atlantic Ocean are examples of the successful modeling of estuaries to find answers to complex problems.

A model study of the Potomac estuary at Washington would be worthwhile as a means of determining the best design, arrangement and method of operation of the proposed Washington Recreation Basin. The model could be used to determine the changes in tidal range and circulation that would result from construction of the barrier and it would answer many other important questions.

The construction and operation of a model would be valuable also as a means of demonstrating to officials and representatives of the public how the River behaves and what might be accomplished by construction of the works discussed above.

Cost of the Recreation Basin

The development of a basin which will abate pollution and provide full recreational use of the Potomac River above 14th Street, would involve the construction of: (1) a barrier near 14th Street which is estimated to cost $8,000,000 if built in conjunction with a new bridge, and $13,000,000 if bridge piers cannot be used to support the barrier gates; (2) a diversion conduit to carry Rock Creek and combined sewer overflows to a point below the barrier at an estimated cost of $15,000,000; and (3) works to isolate the flow down Boundary Channel and discharge it below 14th Street, at an approximate cost of $2,000,000. The total cost of this development will vary from $25,000,000 to $30,000,000, depending upon whether or not the barrier is built as part of a new bridge at 14th Street.

The construction of this project need not await completion of all the interceptors, relief sewers, pumping stations and treatment plants that have been recommended as necessary parts of the general program to reduce pollution in the Potomac River. Of the $133,000,000 sewerage system improvements recommended by the Board of Engineers,[10] only separation of the combined sewer area in Georgetown and relief of the Upper Potomac Interceptor are urgently needed insofar as the Recreation Basin project is concerned. These would cost about $9,000,000 and are scheduled for construction prior to 1963. The Rock Creek Conduit could then carry the combined sewage overflows to a point below the barrier until the other improvements recommended by the Board had been completed. During the intervening period the overflows into the Basin would not be as infrequent as anticipated, but the difference would not be great. Insofar as storm water overflows are concerned there would be no improvement in the River below the barrier until the balance of the works proposed by the Board of Engineers had been completed.

Without the construction of a large reservoir above Great Falls for water supply, flood control, silt removal, low flow regulation and other purposes, it is very doubtful that the Recreation Basin project should be seriously considered. Without this reservoir, the Basin would increase silt deposition and the Basin water would be turbid most of the time. However, if it becomes certain that a dam will be built at Riverbend, there is no reason why construction of the Recreation Basin should not go ahead.

The value of the proposed Washington Recreation Basin cannot be measured in terms of monetary benefits. Its justification, therefore, must rest on the intangible values of increased recreational use and enjoyment of the Potomac River and increased pride in the beauty of the Nation's Capital. Under these circumstances the decision as to whether or not the Basin is worth its cost rests with the public in greater degree than is usually the case. No government agency will urge its construction on health or economic grounds alone. Public opinion and support must provide the answer.

POLLUTION CONTROL FOR THE TIDAL ESTUARY

Development of the Recreation Basin above 14th Street will not afford relief from pollution in the balance of the Potomac estuary. The minor changes that occur below the barrier, if it is built, may be in the wrong direction because the area and volume of water available for stabilization of pollution will have been decreased. For the purposes of this report it is assumed that the measures proposed for reducing pollution of the tidal estuary, will be the same whether or not the barrier is constructed.

The estuary of the Potomac River is extensively used below 14th Street for pleasure boating. This form of recreation should be made, if possible, safe and enjoyable throughout all parts of the tidal estuary. Accomplishment of this objective should improve the River sufficiently so that game fish may return and the water may be satisfactory for all uses except swimming and public water supply.

In most large cities pollution abatement can easily, though not inexpensively, be accomplished by construction of sewage treatment works designed to remove a calculated percentage of the pollution load on the river. The problem in Washington unfortunately is by no means this simple.

Sanitary engineers and biologists have hesitated to recommend a high level of sewage treatment for the Washington Area, in fear that the greater conversion of sewage solids into nitrates and other readily available plant foods may stimulate heavy growths of algae in the River. What would happen in the River if silt were removed and larger amounts of more completely mineralized sewage were added is not predictable. Difficulties with biological growths could be severe, or less probably, slight.

For years Baltimore discharged its highly treated sewage into the Back River estuary which, like the upper estuary of the Potomac, has a long flushing period. From time to time very abundant algae growths developed. When these algae died they were blown ashore, or else decomposed in the water. Oxygen disappeared, fish died and odors prevailed in the area. The pollutional load caused by the death of algae was at times as great as the load would have been had the sewage not been treated at all. Both chlorine and copper sulfate were tried in attempts to control algae growths in Back River, but the results were disappointing. The problem in Baltimore was finally solved when the Bethlehem Steel Company piped a large part of the effluent, after further treatment, down to Sparrows Point, used it for process water and discharged it into the Patapsco estuary under much more favorable dilution conditions.

The behavior of the Potomac estuary, under future conditions of increasing discharges of highly treated sewage, is not predictable. The River might come into biologic balance and support an abundant growth of game fish and all intermediate forms of life. Or it might at times be overwhelmed with algae that create violent nuisances. Little is known at present about how to control algae growths in estuaries or lakes that are heavily fertilized with treated and hence mineralized sewage. Difficulties with algae growths are increasing in many parts of the country, not only as a result of greater discharges of more completely treated sewage,

but also because of the increased uses of agricultural fertilizer, much of which finds its way into rivers and lakes. As algae problems become more severe, they will be given greater attention and perhaps some solutions may be found.

Two approaches are possible to a solution of the pollution problem in the tidal estuary of the Potomac River at Washington. The first of these is to pump the treated sewage effluents over to the Chesapeake Bay and the second is to continue discharging the treated sewage water into the Potomac and taking such measures as future experience and research indicate might improve the situation. The first of these approaches is favored because of the many uncertainties relative to the biological behavior of the estuary if the second alternative were followed. The engineering and other problems involved in carrying the treated effluents to the Bay will, therefore, be discussed first. The possibilities for improving the Potomac in event Bay discharge is impossible will then be considered.

Discharge of Treated Sewage in the Chesapeake Bay

The treated effluents from the Arlington County and the District of Columbia sewage treatment plants could be pumped through a pipeline leading from Blue Plains to the Chesapeake Bay and could be discharged in the deep water of the Bay a mile or more off shore. If this were done, it would remove from the upper estuary of the Potomac three-fourths of the total daily quantity of treated sewage. The remaining one-fourth would be discharged at Hunting Creek below Alexandria and at the outlets of other tributaries farther down the River. Removal of this large portion of the treated sewage would assure freedom from future difficulties with algae growths in the upper Potomac estuary.

Compared with the Upper Potomac estuary, the Chesapeake Bay is a very large body of water. An amount of treated sewage which might in the future cause severe difficulties in the Potomac at Washington would undoubtedly have little or no measurable effect on the waters of the Bay. Since it would be difficult to overfertilize the Bay, the additions of nitrogen and phosphorus could only stimulate the great biological activity in its waters, and increase the production of fish and other sea foods.

The magnitude of such a project should not dismay us, for the Chesapeake Bay is less than 30 miles from Washington. Although no cities now transport their treated sewage this distance to a point of disposal, many cities bring their water supplies from much greater distances. The length of New York's supply conduits and tunnels now totals more than 200 miles. Los Angeles brings water from the Colorado River 250 miles away. Baltimore will go for more water to the Susquehanna River, 40 miles from the City. Just as cities have had to go great distances to find more satisfactory water supplies, they may have to take sewage considerable distances to points of more satisfactory disposal.

The proposal to dispose of the treated sewage of the Washington Area and other communities in Chesapeake Bay will undoubtedly raise questions in the minds of people who seek recreation there or whose incomes are derived from commercial fishing. These questions will have to be debated before a final decision can be reached. In such public exploration, however, it must be emphasized strongly that the water to be discharged is not sewage. It is the effluent from one or more sewage treatment plants. The reason for carrying such treated water to the Bay is that it contains more fertilizing minerals (nitrogen and phosphorus compounds) than the

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waters of the upper Potomac estuary may be able to assimilate. These same minerals in a body of water as large as Chesapeake Bay may in fact be beneficial.

In order to avoid any possible effect on the recreational uses of the Bay the treated effluent should be discharged well off shore in deep water where tidal currents will disperse it throughout the tremendous volumes circulating up and down the Bay. If it developed that a rise in the number of bacteria was sufficient to cause concern, the effluent could be chlorinated. Chlorination may be desirable as a measure to maintain the pipe line capacity and thus cut pumping costs. New York chlorinates water going into its Catskill Aqueduct in order to maintain the flow. If chlorine is used for this purpose, it is unlikely that bacteria could reach the Bay in sufficient numbers to be a problem.

This project would have potential benefits other than the control of pollution in the upper tidal estuary of the Potomac River. The most important of these would be the opportunity it affords for solving the sewage disposal problems now developing in the Patuxent River watershed of Prince George's and Anne Arundel Counties. Although parts of the areas involved are in Metropolitan Washington, these problems have not been mentioned because the Potomac River is not affected. The difficulties in the Patuxent Basin owe their origin to the very small flows in this stream. The headwater flows of the Patuxent are stored at the Rocky Gorge and Triadelphia reservoirs by the Washington Suburban Sanitary District and used as its source of water supply. Most of this water is diverted into the Potomac Basin and arrives ultimately at the Blue Plains sewage treatment plant in the District. The flow of the Patuxent River is insufficient to provide a satisfactory place for disposing of future highly treated effluents from the Patuxent Basin populations predicted for either Prince George's or Anne Arundel County. If the conduit to the Bay is constructed it could pick up treated sewage from the Patuxent Basin and perhaps from other areas along the way.

There are other potential benefits if the pipe line to the Bay is built. One of these is the possibility of using the sewage water for supplemental irrigation of farm crops. Another is its use as a source of fresh water for industries that might locate on the Bay. Such use has made possible the expansion of the Bethlehem Steel Company's plant in Baltimore. Heavy industries are having difficulties finding tidewater sites where large volumes of fresh water, suitable for industrial processes, are available.

In order to estimate the cost of pumping the treatment plant effluents to the Chesapeake Bay it will be assumed that the project is designed for the following conditions.

1. The quantities of effluent to be provided for will be:

	Maximum Daily Discharge of effluents, in MGD		
Treatment Plant	1970	1980	2000
Blue Plains	300	380	500
Arlington County	45	50	65
Prince George's County	10	20	35
Anne Arundel and Calvert Counties	5	15	30
Totals	360	465	630

2. Arlington County effluent, which may be given secondary treatment either at the present plant on Four Mile Run or at the Blue Plains Plant in the District of Columbia, will be carried across the River to Blue Plains.

3. Patuxent Valley treated sewage will be pumped into the conduit at the Patuxent River crossing.

4. Effluent storage will be provided at Blue Plains to iron out hourly fluctuations in plant discharge and permit the pumping station and conduit to operate at a uniform rate throughout any 24 hour period.

5. During periods of heavy rainfall, the combined sewage in excess of the Blue Plains treatment plant capacity will be by-passed to the Potomac as is now proposed by the Board of Engineers.[10/]

6. The effluent will be discharged off shore in the Chesapeake Bay at a point where it will be dispersed by tidal and other currents in the open waters of the Bay.

A variety of systems could be designed to meet these conditions. For example, the effluent could be pumped at one or at more than one point; the conduit could be all pipe line or a combination pipe line, tunnel and open channel, and any of several points of discharge might be chosen. If it is decided by the responsible authorities that the effluents should be discharged in the Bay, these, and many other features, will have to be worked out in the next few years.

It is estimated that the pumping stations, pipe lines and other works (see Figure 1) designed for the conditions stated above and for the amounts of treated sewage to be pumped in the year 2000 would cost $55,000,000 at today's prices.

This expenditure is comparable with that for pollution abatement works constructed during the period 1950-1960. It is much less than the amount that needs to be spent on the sewerage systems. The pipe line to the Bay would not remove the necessity for the latter expenditures. Its cost is not, however, of unusual magnitude when compared with that of other works to be built.

Corrective Measures if Effluents are Discharged to the Potomac

The uncertainties concerning the biological behavior of the Potomac estuary if silt is removed and it receives increasing amounts of more highly treated sewage have been discussed above. Several measures might be taken to reduce the pollutional load in terms of oxygen demanding materials carried by the treated effluents. Unfortunately, it is impossible to foretell what impact, if any, these measures would have on biological behavior. On present knowledge not one of them could be counted on to remove any of the uncertainties involved. In order of discussion these measures are: (1) increase the degree of secondary treatment, (2) polish the effluent by some form of tertiary treatment, (3) pass the effluent through oxidation and dilution ponds and (4) pipe the treated sewage farther down the Potomac River.

It would not be difficult to increase the degree of secondary treatment. In the existing plans for improvements to sewage treatment plants, it is proposed that all communities in the Washington Metropolitan Area remove 80 percent of the oxygen demanding materials from their sewage. This is an intermediate degree of treatment chosen because it would hold the oxygen demand on the River to a total of

120,000 pounds per day. Rescheduling of construction to fit this requirement to the more recent population estimates has been discussed in an earlier section on sewage treatment. An increase in plant efficiencies from the proposed 80 percent to one of 90 percent would cut the oxygen demand load on the River in half. If 95 percent removal were provided the load would be only a fourth as much as at 80 percent. Activated sludge sewage treatment plants, of which the Blue Plains plant now under construction is a modified form, can easily be designed and operated to remove 90 percent of the biochemical oxygen demand and often attain efficiencies better than 95 percent.

If, when all communities are removing 80 percent of the BOD, observation of the River indicates that oxygen load entering with treated sewage is still the critical problem, it then may be decided that all plants in the area should be enlarged in order to provide higher levels of treatment. It would be fruitless to decide now what degree of treatment should be installed some two decades in the future, when much better information on which to base the decision will be available later on.

Plant efficiencies can be increased by installing a third stage in the process as well as by increasing the degree of treatment in secondary devices. Chlorination of the effluent is a form of tertiary treatment which will be available in the Washington area plants and can be used when warranted. Other known possibilities are coagulation and sedimentation, sand filtration and micro-straining. Coagulation and sedimentation facilities have been provided at Baltimore's sewage plant but are not much used because the Bethlehem Steel Company, which owns and operates the tertiary plant, has found the secondary treatment process effluent satisfactory for steel making without additional treatment other than chlorination.

Slow sand filters of the intermittent type have been used for many years as a means for secondary treatment of sewage, particularly in small plants and where beds of natural sand are available. If not properly operated and maintained, these filters give trouble when used for secondary treatment of sewage. Although such difficulties might be reduced if the beds were used for tertiary treatment, it is unlikely they would reduce the nitrate and phosphorus problem and they would require such large land areas as to be wholly impractical in the Washington area.

The relative efficacy of rapid sand filters and microstrainers for tertiary treatment of trickling filter effluents at Luton, England,[23] has been given reasonably thorough study. The sand filters reduced the suspended matter content of the effluent 73 percent and the biochemical oxygen demand 49 percent. The microstrainers reduced suspended matter 65 percent and the biochemical oxygen demand 32 percent. Since both the installation costs and the pumping costs for rapid sand filters would be considerably higher than for micro-strainers, the latter appeared to be the more economic form of tertiary treatment. The removals that would be obtained when treating a highly clarified activated sludge effluent are unknown. It might be worth while to look into this question further, at least to the extent of operating experimental micro-strainers at one or more plants in the area.

Effluent oxidation ponds are mentioned here because they could be developed for relatively little expense by throwing dikes around some of the tidal shallows near the sewage plants. These areas now function as uncontrolled oxidation ponds that are believed to account for the great reaeration and pollution assimilating capacity of the upper Potomac estuary. If the ponds were designed to fill through the upper end on the incoming tide and discharge at the lower end as the tide recedes, they would provide both mixing and dilution as well as some stabilization of the effluent

before it reached the main body of the River. There would be some advantages also in that the diluted effluent would be discharged farther from the center of the Metropolitan area.

Three areas might be suitable for development into tidal oxidation and dilution ponds. Oxon Bay just south of the Blue Plains treatment plant is the most promising of these areas. It would be possible here, by construction of 16,500 feet of dike and the necessary inlet and outlet works, to form a tidal basin some 1270 acres in area. Since this basin would hold 2660 mg of water at low tide and 3900 mg at high tide, its theoretical flushing time would be 2.14 tidal cycles. On the basis of 1970 flows at Blue Plains, during the filling cycle, 51 mg of sewage would be added to and mixed with 1189 mg of river water. This same water would be discharged some 25.3 hours later from the lower end of the basin. Since some settling, aeration and stabilization would occur during this period, the basin discharge would probably have less effect on the River than the undiluted discharge. Again, however, uncertainties regarding biological behavior of the basin and the River make it impossible to predict whether or not construction of a tidal pond for dilution and stabilization of the effluent would be desirable.

Some light might be shed on this question by constructing a smaller basin and diverting to it a part of the treated effluent. This basin could be so arranged that later it might serve as the reservoir from which effluent is pumped to the Bay if it is decided that discharge of the effluent into the Bay is the only certain method by which to control conditions in the estuary of the Potomac River in Washington.

If the tidal basin proved to be of sufficient benefit to merit its development and extension, there are, in addition to Oxon Bay, large areas of shallow water across from Alexandria and at the mouth of Hunting Creek that could be used in a similar manner.

The suggestion has been made from time to time that the sewage plant effluents be discharged farther downstream in the Potomac estuary. There are a number of reasons why this would be unwise. In order to improve conditions measurably in the heart of the Metropolitan Area, the point of discharge would have to be at least as far south as Fort Washington, seven miles below the present outfall at Blue Plains. At this distance, the discharge would still be within the Metropolitan Area and would be returned by the tide to the heart of the City. Since the River in this vicinity has greater surface and larger tidal flow, it could undoubtedly assimilate a greater pollution load with less oxygen depletion than is the case upstream, but this advantage is completely offset by the fact that the sewage from all the drainage areas south of Oxon Run and Cameron Run must also be disposed of into the Potomac. By the year 2000 the sewage from a population of 650,000 must be treated in plants located along the Potomac below Alexandria. The future population may be distributed about as follows:

Drainage Basin		Population
Henson Creek, Md.	-	175,000
Piscataway Creek, Md.	-	120,000
Little Hunting Creek, Va.	-	55,000
Dogue Creek, Va.	-	60,000
Accotink Creek, Va.	-	135,000
Pohick-Giles Creek, Va.	-	50,000
Occoquan Creek, Va.	-	40,000

Each of the above drainage basins will have a treatment plant from which the effluent discharges to the Potomac and for which the capacity of the Potomac to assimilate treated sewage in this area must be reserved.

Control of the quality and condition of the water in the tidal estuary of the Potomac will be difficult. If, in the future, the practice of discharging all treated sewage within the City is to be continued, few constructive suggestions can be made. Higher levels of treatment can be resorted to if future experience indicates that this would be beneficial, and tertiary treatment devices, as well as the tidal oxidation and dilution ponds, can be investigated. Since none of these measures would significantly reduce the fertilizing elements discharged to the River, none of them are likely to avoid the problem of excessive algae growth if it develops.

It is recommended, therefore, that serious consideration be given to discharging the treated sewage into Chesapeake Bay, and that the preliminary studies necessary to crystallize a project of this magnitude be started within the next few years.

SANITATION OF THE TIDAL ESTUARY

It would be improper to close a report on the subject of a clean Potomac River for Washington without mentioning the poor sanitation and housekeeping practices that contribute to the condition of the River and discussing how these practices might be improved, or their effects reduced.

Boat and Ship Sanitation

The overboard discharge of toilet wastes, garbage, trash and oil is a problem in all harbors, recreational as well as commercial. Overboard disposal has been the custom for so long that nobody pays much attention to its sanitary significance. There has been some effort to reduce the amount of oil discharged from ships or to skim it from harbor waters, because oil creates a fire hazard, is unsightly and fouls the paint on boats and ships. Floating trash is sometimes removed because it also is unsightly and is a hazard to navigation. But, so far as is known, there is not a toilet equipped craft afloat that does not flush wastes overboard. In already polluted harbors where recreation is a minor use, overboard disposal of wastes may be tolerated even though it is not a sanitary practice.

In recent years this problem has received some attention from public health and pollution control agencies, and a few devices or schemes which might reduce pollution by ship's wastes have been suggested. Treatment of wastes prior to discharge overboard is one suggestion. Although sanitary wastes could be put through grinders and then heavily chlorinated or given other chemical treatment before discharge, the cost, the technical difficulties and the efficiency and reliability of such schemes are unknown. Storage of wastes while operating in harbors is another suggestion. This idea seems reasonable for larger ships which have space for tanks, and crews that could discharge them at sea or through a sewer connected facility at dockside. Holding wastes on small vessels, pleasure boats, tugs and other harbor craft, might not be too difficult, but getting the wastes ashore and into the sewer would not be an easy or pleasant task.

The problem is one that must be given study in the future, for the quantities of these wastes will mount with the increased use of harbors. Although the number of people on the River at any time is small compared to the shore population, it is not small in absolute terms. Moonlight cruise ships carry hundreds of passengers, and the number of large pleasure craft that operate on the River on week ends is mounting into the hundreds. Of even more significance is the fact that the sanitary wastes from ships and boats constitute the most dangerous kind of health menace because, since the discharge is direct and often near or in the areas used for recreation, time and dilution cannot be counted on to give any degree of protection.

The problem of proper boat sanitation has been mentioned in discussing the suggested Washington Recreation Basin. Some kind of protection against direct discharges into this basin from boats must be provided if the full recreational potentials of this type of development are to be safely enjoyed.

The sanitary disposal of human wastes originating on boats will probably not become a reality until people come to feel towards recreational waters as they do

toward the parks where they picnic. This degree of sanitary consciousness is probably a long way off. Furthermore, it might be argued that there is little point in working toward a solution of the boat problem while the River is being contaminated with storm-water overflows and partially treated sewage. There appears to be much logic in this argument, except that if neither foot is put forward until the other has been advanced first, progress is nil.

Garbage and Refuse Disposal

Sailors are by no means the only offenders when it comes to throwing trash and garbage in the River. Everyone does.

One might speculate on how many years would be required for the bottom of the River to be covered with beer cans and bottles, assuming none of them were dredged up along with the silt. Although it would undoubtedly take a long time, the mental picture of a river bottom littered with thousands of beer containers is not a pleasant one.

It would not be particularly troublesome to provide and use other means of trash and garbage disposal but it will be difficult to change a custom so ingrained as the practice of throwing things in the River. Education, cooperation and the development of pride in the condition of the River give most promise of improving the situation. As with highways, laws and signs might make people think and thus have educational value, and there could be penalties for abusing the River, but these things would not completely solve the problem. Provision of ample waste receptacles along docks and park shores would help. Insofar as boats are concerned, the various boat clubs could do a great deal by encouraging members to help keep the River clean.

Flushing of the Estuary

Flushing is one of the simplest and most effective methods of cleaning known. Perhaps this age old measure can be applied with advantage to the housekeeping of the Potomac River. Upstream reservoirs will be the tanks, and stored floods the water. Releases of water from upstream reservoirs have in the past been thought of primarily in terms of sustaining more or less constant flows in the range of 2000 to 4000 cubic feet per second. Study of the behavior of the River under past pollution loads shows that this would have little or no effect on the condition of the River in Washington. In fact, the quality of water in Washington appears to be almost completely independent of river flow for all discharge rates below 10,000 cubic feet per second. This may be because at these flows the estuary behaves like a toilet bowl through which water is passed at an inadequate rate. What may be needed is a good flushing. An upstream release of 20,000 cubic feet per second for 36 hours, and no release for five and a half days, might be much more beneficial than a release of 4,000 cubic feet per second continuously throughout the week. Of course this statement is not intended to imply that weekly flushing is considered necessary nor that there need be no upstream releases during intervals between flushing.

If the River above the 14th Street bridges is converted into a controlled recreation basin by construction of a tidal barrier, it will be desirable to maintain a more or less continuous flow of about 1000 cubic feet per second in order to operate

locks, if provided, and to assure a positive flow through the Tidal Basin in Washington Channel and through Boundary Channel. Another 500 to 1000 cubic feet per second will have to come down the River to the Washington water supply intake. The sum of these releases should be adequate to maintain the beauty of Great Falls. Releases for intensive flushing could be periodically superimposed on these smaller regulated flows.

Many benefits might be realized by an intelligent use of periodic flushing of the River. Algae growths and other biologic phenomena might be kept under reasonable control. The River could be purged when runaway growths suddenly died off and began to decompose. Shock loads of untreated sewage entering the River during periods of heavy rain in the District of Columbia could be diluted and carried away. It is time to think of a clean Potomac in terms of other things besides more sewage treatment. Good sanitation, good housekeeping and sweeping out of the River can and should be a part of the total effort.

FINANCE AND ADMINISTRATION

The proposals for improving the Potomac River in the immediate vicinity of Washington, D.C., and the River many miles below the Capital would entail an immediate expenditure of $25,000,000 for the barrier contemplated near 14th Street and the collateral works essential to make and keep the resulting basin clean. The costs of supplementary sewage treatment and extensions of outfall, on the schedule projected, are difficult if not impossible to estimate pending the completion of further studies and experiments already delineated in this report. Without such prior studies, decisions on supplementary treatment, beyond that hitherto described, would be hazardous.

The existence of the Capital of the United States at its present location accounts both for the tremendous population growth in the Metropolitan Area in Virginia and Maryland, and the consequent river pollution problem. The two major recommendations in this Report for recapturing the quality of the River both stem largely from the fact that the Capital requires esthetic, recreational and public health assets of a level perhaps economically unwarranted elsewhere. It is to meet these high level quality criteria that proposals above and beyond those normally acceptable to the population and economically feasible are here recommended.

In order to accomplish these purposes, it is our judgment that the Federal Government should pay for both the barrier and its collateral works and the added terminal treatment and outfall facilities required beyond those which would be naturally required by the population to recover and preserve a reasonably clean stream. In other words, the District of Columbia, the Virginia and the Maryland communities tributary to the Potomac should continue their financial responsibility for lateral sewers, interceptors and treatment plants to that level of treatment recommended in this report. Beyond these local fiscal responsibilities, supplementary works should be financed by the Federal Government as part of the development and protection costs of the Capital of one of the major countries in the world.

Much consideration has been given to the question of the responsibility for the execution of the projects proposed. We deal here with a multiplicity of governmental political units: the District of Columbia, the States of Maryland and Virginia, a number of counties and innumerable cities. To consolidate parts of these, for the purposes here discussed, into a single administrative unit, even if theoretically desirable, would require years of negotiation; Federal, State and local legislation; and continuing battle against opposition rooted in adherence to local autonomy and responsibility.

We do not recommend any such time-consuming and embattled steps to accomplish the objectives, some of which should be initiated at once and consummated within several years.

The procedure for administration should follow the general principles outlined above for finance. Under such principles, the U.S. Army Corps of Engineers would be delegated the responsibility for design, construction and administration of the two major groups of projects herein recommended, the Recreation Basin and the outfall to the Bay. All other works would remain the continuing administrative responsibilities of the existing agencies or their future counterparts.

In order to assure complete integration of the activities of the Corps of Engineers with the undertakings for river improvement of other agencies in the region, the Interstate Commission on the Potomac River Basin should be given the responsibility, preferably by Congressional statute, to oversee these activities, with veto power if necessary, to avoid undertakings which would vitiate the primary objectives here delineated.

The comprehensive metropolitan-wide plan herein described, if adopted, provides the basis for both the establishment of future needs of the various political jurisdictions, and the time schedule for construction to meet those needs. The Interstate Commission on the Potomac River Basin appears to be the logical agency for the continuing coordination of this program and for the militant pressure toward its prompt implementation.

SUMMARY AND CONCLUSIONS

The Potomac River in the Washington Metropolitan Area is polluted by silt from eroding lands upstream, sewage from combined sewerage systems, effluents from sewage treatment plants, surface wash from streets and yards, sewage from boats and by trash and garbage. Each form of pollution presents a different type of problem.

The first three kinds of pollution are the most serious: silt, combined sewage, and treatment plant effluents. Silt is filling the tidal estuary, combined sewage contaminates the creeks and waterfronts when it rains and treatment plant effluents load the River with fertilizers that can produce rank growths of algae.

Siltation must be prevented in order to preserve the water areas and enjoy the benefits of other pollution control measures. Construction of a large reservoir above Great Falls is considered the only practical way to solve this problem. The reservoir is also needed for water supply and other purposes.

When it rains in Washington, raw untreated sewage mixed with surface water discharges through numerous outlets in the District of Columbia and in Alexandria. The complete solution for this problem is complete separation of the sewerage systems in these cities. The direct cost to the District of Columbia would be about $300,000,000. The attendant interference with traffic and business is as forbidding as this great cost. The Board of Engineers has recommended a plan for reducing the severity of the problem by separating the systems in three areas, and providing sewers to carry more of the combined sewage to the treatment plant. The recommended works would cost $133,000,000 over a ten year period. All of these works are desirable and some of them are urgently needed to prevent further deterioration of the River.

The part of the Potomac estuary upstream from the 14th Street bridges can be returned to a state of cleanliness that would make all forms of recreation safe. In order to do this, overflows of combined sewage must be prevented and the upstream tidal excursion of polluted water must be blocked. These requirements can be met by constructing a tidal barrier in the vicinity of 14th Street and diverting the flow of Rock Creek as well as the storm water overflows through a conduit along the bank of the River. Water in the Recreation Basin thus formed, would be held at a constant level. The broad top of the conduit, if placed a foot or so above this level, would provide abundant access to the basin for boating, swimming and fishing. It could serve as a promenade and major recreational facility along a beautiful Potomac Park. Its construction would afford unusual opportunities for waterfront beautification. Diversions from the basin would cleanse the existing Tidal Basin and flush Washington Channel. Development of this water recreation basin would cost $25,000,000.

In the balance of the estuary it will be impossible to attain a degree of cleanliness that would make swimming safe. Overflows from combined sewers and sewage from boats will go on contaminating the tidal River for many years. It will be possible to make this part of the Potomac a safe and pleasant place to boat and fish, provided that heavy fertilization of the water with treated sewage does not cause

uncontrollable, nuisance-producing growths of algae. The only sure way to prevent excessive biological activity is to pump the bulk of the treated effluents over to the Chesapeake Bay. If properly dispersed, the treated sewage should not cause difficulty. A conduit to carry District of Columbia, Maryland and Arlington County effluents to the Bay, with capacity adequate until the year 2000, will cost $55,000,000.

The individual communities should continue to plan, finance and build their sewers and sewage treatment plants. Since the Recreation Basin would serve all the Metropolitan Area and would afford pleasure to all the people that visit Washington, its construction could appropriately be financed by the Federal Government.

The unforseen pollution problems resulting from the location of the Nation's Capital at the head of a narrow and sometimes nearly stagnant estuary will probably make it necessary to pump treated sewage to the Bay. Since all communities will build sewage treatment plants, but not all effluents will be pumped out of the area, a fair distribution of the cost will be difficult. The unfavorable location of the Washington Metropolitan Area, the great expense borne by the communities for sewers and sewage treatment, and the difficulty of equitable distribution of costs, suggest it would not be unreasonable to seek Federal aid in the planning, constructing and financing of a conduit to the Chesapeake Bay.

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Senator BIBLE. Our next witness will be Colonel Sumner.

STATEMENT OF COL. GEORGE B. SUMNER, DISTRICT ENGINEER, UNITED STATES ARMY ENGINEER FOR THE DISTRICT, WASHINGTON, D. C.

Colonel SUMNER. I was here 2 days ago and made a statement then, Mr. Chairman.

Senator BIBLE. I see.

You are recalled for further questioning, is that it?

Colonel SUMNER. Yes, sir.

At this time I was asked to submit a statement for the record, which I have. I will be happy to read it or just submit it.

Mr. GUTHEIM. In Colonel Welling's discussion of the water committee of the Metropolitan Water Conference, he referenced their action to the description of the Potomac Basin survey which the committee had made available to him.

Our committee has examined the outline of the engineer's report and are satisfied as to the coverage to be provided, not only in the field of navigation, flood control, hydroelectric power, water supply, pollution abatement measures, but recreation, fish and wildlife, conservation, and a sizable allotment from the Corps of Engineers' resources are made available to other engineers so that they may prepare reports on such items as recreation, fish and wildlife, conservation—

At that point, Colonel Welling was interrupted, and Senator Bible said:

May I ask a question—Is this a study on the metropolitan—complete metropolitan area?

Colonel Welling said:

No, it is a study of the entire Potomac River Basin.

Now, sir, the subsequent 2 days' testimony produced a number of references to the Potomac River Basin survey, indicating its extremely comprehensive nature and the desire of our committee to coordinate its own studies with this Potomac Basin survey, both in terms of subject matter and schedule, and the references to the need for surveys and studies of the Potomac. The report of our consultant, Mr. Bernard Frank, has also suggested very strongly the desirability of a fuller statement by the corps of exactly what is to be covered.

Senator BIBLE. Did you or did you not testify on that the other day?

Colonel SUMNER. I did not.

Senator BIBLE. Well, I think we have a starting point.

Do I understand that your statement today gives us a detailed description of the scope of the Potomac Basin survey?

Colonel SUMNER. No, sir, the statement that I have at this point is answers—more complete answers—to questions that were asked the other day. This is a new question on which I am prepared to testify.

Senator BIBLE. I see. I would then think that your answers to your appearance the other day would be made a part of the record at this time and without the necessity of your testifying and reading them into the record. Then I think it would be helpful, I recall Colonel

Welling's testimony and I did raise the question as to the scope of the proposed Potomac Basin survey and I would direct your attention to that particular phase of this problem. But I will make your answers a part of the record at the conclusion of your testimony.

Colonel SUMNER. As directed in the Senate resolution, we are performing a comprehensive survey of the Potomac River Basin with relation to water and related uses.

Senator BIBLE. What was the date of the resolution?

Colonel SUMNER. The resolution was January, 1956.

Senator BIBLE. Thank you.

Colonel SUMNER. I can give you the exact date.

Senator BIBLE. That is all right—January of 1956 is all right.

Colonel SUMNER. And we were directed in the resolution to give emphasis to water supply and pollution abatement, but the survey will include recreation, fish, and wildlife, and all aspects related to water.

In the carrying out of the study, the investigation, we will have the cooperation of the Department of Agriculture, the Department of Commerce, the Department of the Interior, and I may develop that a little further.

The Department of Agriculture, primarily the Soil Conservation Service, will determine its program for the basin and the relation of its program to Corps of Engineers planning—will develop, using pilot plans and existing work plans, a watershed treatment program to minimize runoff. It will coordinate with the corps, and other agencies conducting economic surveys. It will furnish data on existing agriculture and other rural land use. It will prepare forest management plans for the basin, will recommend on reforestation in proposed project areas, will evaluate the reforestation program in conjunction with watershed treatment programs. Will determine present and future economics of farming projects, and acreage and land values.

Mr. GUTHEIM. Colonel Sumner, may I interrupt at this point to inquire if in this phase of the work or any other, there is to be consideration of the silt problem to which Dr. Geyer had earlier referred?

Colonel SUMNER. Yes, of course, that in itself considers the silt problem, but the Geological Survey under the Department of the Interior, in addition to determining ground water resources, will, in cooperation with the Department of Agriculture, obtain data on sedimentation within the basin.

Mr. GUTHEIM. Thank you.

Colonel SUMNER. So, they will have primary responsibility for the silt determination.

The National Park Service will, in cooperation with the corps and other interested agencies, develop a recreation plan for the area and will evaluate the recreational aspects of project areas in coordination with the States.

All of this survey will be coordinated with the various State agencies that are concerned.

The Fish and Wildlife Service will inventory the fish and wildlife sources of the area, and determine the effect of water resources development on them. Will make recommendations for operations

to maximize fish and wildlife benefits. Will assign monetary values to such benefits.

The Office of Business Economics will, in cooperation with other sections of the Department of Commerce, prepare an economic basic study of the basin, including projections of the growth of the region and subregions in terms of such overall indicators as population, employment, and personal income.

The Coast and Geodetic Survey, the Weather Bureau, the Bureau of Public Roads, are all cooperating in the study.

The Bureau of Mines is collecting information on mining activities and the effect of water resources development on mining and the errect of future mining on water resources, particularly on water quality.

Mr. GUTHEIM. Sir, this relates, I presume, primarily to acid mine wastes as pollution of the Potomac?

Colonel SUMNER. That is right.

Mr. GUTHEIM. Are you going to continue to the point where the role of pollution studies in the basin surveys will be discussed?

Colonel SUMNER. The Public Health Service—United States Public Health Service will make studies pertaining to pollution abatement, water supply and public health, and sanitary quality of water, to include pollution or dilution requirements. Will determine monetary benefits of pollution abatement by value of water for industry, including processing and cooling water benefits and municipal water supply benefits.

Of course, throughout the study, we are cooperating fully with the Interstate Commission on the Potomac, and have been represented on the advisory—well, that was included in the Senate resolution—and we do have them represented on the advisory group that is working with us throughout this study.

Senator BIBLE. Colonel Sumner, when do you anticipate this complete study will be finished? My understanding it is 1961. Is that correct?

Colonel SUMNER. 1961, Mr. Chairman, with the schedule prepared—something over a year and a half ago, based on receipts of funds and certain progress.

The total estimated cost of the study is $1,050,000, of which to date we have received $140,000. We will not finish the study in 1961 without considerably larger appropriations for the next 3 years.

Senator BIBLE. Is there a request for appropriation now pending in your public works appropriation bill?

Colonel SUMNER. Yes, sir, that is correct. That request, of course, is based on all the other programs and the consideration of everything else that money has to be spent for, and that request is $200,000.

Senator BIBLE. For fiscal 1959?

Colonel SUMNER. Fiscal 1959. Of course, we will not finish the study in 1961.

Senator BIBLE. May I ask one further question? If this plan of survey of the Potomac Basin continues as projected, in what detail will the Army engineers go into the water supply problem and the water pollution or the water pollution abatement problem insofar as it involves the Washington metropolitan area?

Colonel SUMNER. Well, the only answer I can give to that, Mr. Chairman, is that we will go as completely as the situation seems to require, and I think that will be pretty complete.

Senator BIBLE. The reason I ask the question is that when Colonel Welling was commenting on this the other day, it seemed to me that it might be somewhat of an overlapping of effort by a number of different studies and a number of different groups, essentially doing the same thing.

Now I don't know whether I am right or wrong, but I would like to have your views on that. Of course, Congress has a great habit of studying—they study studies and studies made by studies. I am wondering where we are heading in this direction.

Colonel SUMNER. I don't believe there will be any serious overlapping, because we are working with everyone who is doing anything with the problem, and we take advantage of any work that has been done.

Senator BIBLE. Well, if you are doing the survey and you say you think it is going to be fairly complete as far as the metropolitan area is concerned, where does the interstate commission fit into this picture? What are they doing that you are not doing?

Colonel SUMNER. The interstate commission, of course, has had the Wolman survey on the Washington problem.

Senator BIBLE. Correct.

Colonel SUMNER. And, of course, we take full cognizance of that and our studies. They have also recently established water quality standards for various sections and that, of course, we take fullest advantage of that and our studies.

I don't believe there is any duplication there. I think we are doing the technical study whereas they are generally concerned with policies and programs.

Representative HYDE. Well, isn't it a fact that except for the temporary benefit they get from funds as a result of the recent pollution legislation of Congress, the interstate commission doesn't have available any funds which would enable them to make the technical type of survey study as the Army engineers are going to make.

Colonel SUMNER. That is correct. Yes.

Representative HYDE. It ties in with what you just said. Their's is more of a policymaking effort and the work you are doing is a technical, detailed technical study.

Colonel SUMNER. Yes.

Senator BIBLE. You may proceed, Colonel.

Representative HYDE. May I clear up one thing, Mr. Chairman? You said this several times before, Colonel, but I am anxious to have it clearly understood now.

The $200,000 that is now in the proposal will not—we want to make this clear—will not enable you to complete the study by 1961?

Colonel SUMNER. That is correct. I believe with your permission, I will read the answer to that question. The question was asked the other day, and I have the answer here for the record. The question has been asked whether an increase in the appropriation for the study from $200,000 to $500,000 for this fiscal year—this coming fiscal year, would enable completion of the study at an earlier date than June 1961.

The answer to that is "no," but if the appropriations for fical year 1959 should be increased to $500,000, it would be possible to advance materially the work of the cooperating agencies so that it can be available in time to enable completion of the study by June 1961. And, also, it will provide an earlier date—information needed to make some of the general and basic decisions on a future water supply for the metropolitan area.

Much of the work of these agencies is needed before other work can go forward, and unless it can be initiated early in fiscal year 1959, the completion date of the overall study will have to be extended.

Now, that specifically is that we will not be able to do the job by 1961, with the $200,000 appropriation.

Representative HYDE. Well, Colonel, on the basis of what we now know, can you say without fear of contradiction that it will be dangerous to the future water supply and sewage-treatment problems of the Washington metropolitan area to delay this study past 1961, in view of what we know about it—what we are going to need to handle future population in this area?

Colonel SUMNER. I think very definitely it should not be delayed. There are several reasons for it, but that is certainly a major reason: that the water problem is acute now—not the domestic drinking water, but the water problem as a whole, and it is going to get worse each year.

Representative HYDE. Thank you.

Mr. GUTHEIM. Mr. Chairman, may I ask Colonel Sumner if, in his general organization, the Potomac Basin survey is comparable to the Connecticut River survey or other more comprehensive river basin studies which the Corps of Eingineers has undertaken in recent years.

Is there an analogous river basin survey you can mention, or is it somewhat unique?

Colonel SUMNER. I think it is somewhat unique.

If this is agreeable, I will ask Mr. Burrell to help me out.

STATEMENT OF D. V. C. BIRRELL, ASSISTANT CHIEF OF THE ENGINEERING DIVISION FOR CIVIL WORKS, UNITED STATES ENGINEER DISTRICT, WASHINGTON, D. C.

Mr. BIRRELL. The question as to whether this survey is unique I believe is somewhat true insofar as the questions of water supply and pollution abatement of recent years have become more important in the Nation's economy. It least, we have come to realize the situation.

The previous activity of the Corps of Engineers has been devoted to flood control and navigation.

Mr. GUTHEIM. Do you feel it is the growth of population and industry and the increasing metropolitan area demands for water that may be a contributing factor of this broadening of the corps' interest in water supply and water uses?

Mr. BIRRELL. That is definitely the order for it.

As a greater example of the greater significance are the surveys which are presently being conducted on the Delaware River where the state of development is further advanced than that of the water in the Potomac Basin.

There, the question of water supply is not "Where are we going to get it in the future?" but "Where are we going to get it right now?"

Mr. GUTHEIM. Are you referring to the study of the Delaware that is being made by the Corps of Engineers?

Mr. BIRRELL. Yes, that is what I am generally referring to.

Mr. GUTHEIM. Of course, in Delaware, there is also a compact agency, Incodel, that has been in existence for many years and which has been frequently compared with the Interstate Commission on the Potomac River Basin.

I am pointing that out in passing, because I feel the two situations are relatively comparable in the organizational sense, as they are in the substantive sense; as you are pointing out.

Mr. BIRRELL. Did you ask me a question there?

Mr. GUTHEIM. No, I made a comment.

Representative HYDE (presiding). You may proceed, Colonel.

Colonel SUMNER. I believe I have reached the end.

Mr. GUTHEIM. May I ask Colonel Sumner a question?

Representative HYDE. Yes, sir.

Mr. GUTHEIM. Colonel Sumner, I find it astounding that with an increase in appropriations of about one-sixth in this $200,000, versus the $500,000 figure, that it would be impossible to accelerate the study to a greater degree than you have indicated.

Is this due to the cooperative nature of the work?

Ordinarily, if you were building a dam, you would simply put on more men and more machines, and speed it up.

Of course, there are points beyond which you cannot go, but what are the limiting factors?

Colonel SUMNER. Well, in the cooperative studies this year, this next fiscal year, whether or not they went ahead would depend to a considerable extent on whether there is an increase in the appropriations; and, obviously, they have got to have time to do their work.

Mr. GUTHEIM. Do you feel that there is a real urgency in getting on with this study and speeding it up by all possible means? That this committee should do everything in its power to get all of the resources marshaled and placed at your disposal so you can speed this work?

Colonel SUMNER. Well, let me say that I think the work ought to go as fast as it can.

Representative HYDE. That seems to cover it.

Are there any further questions?

Mr. GUTHEIM. No, sir.

Representative HYDE. Mr. Levin?

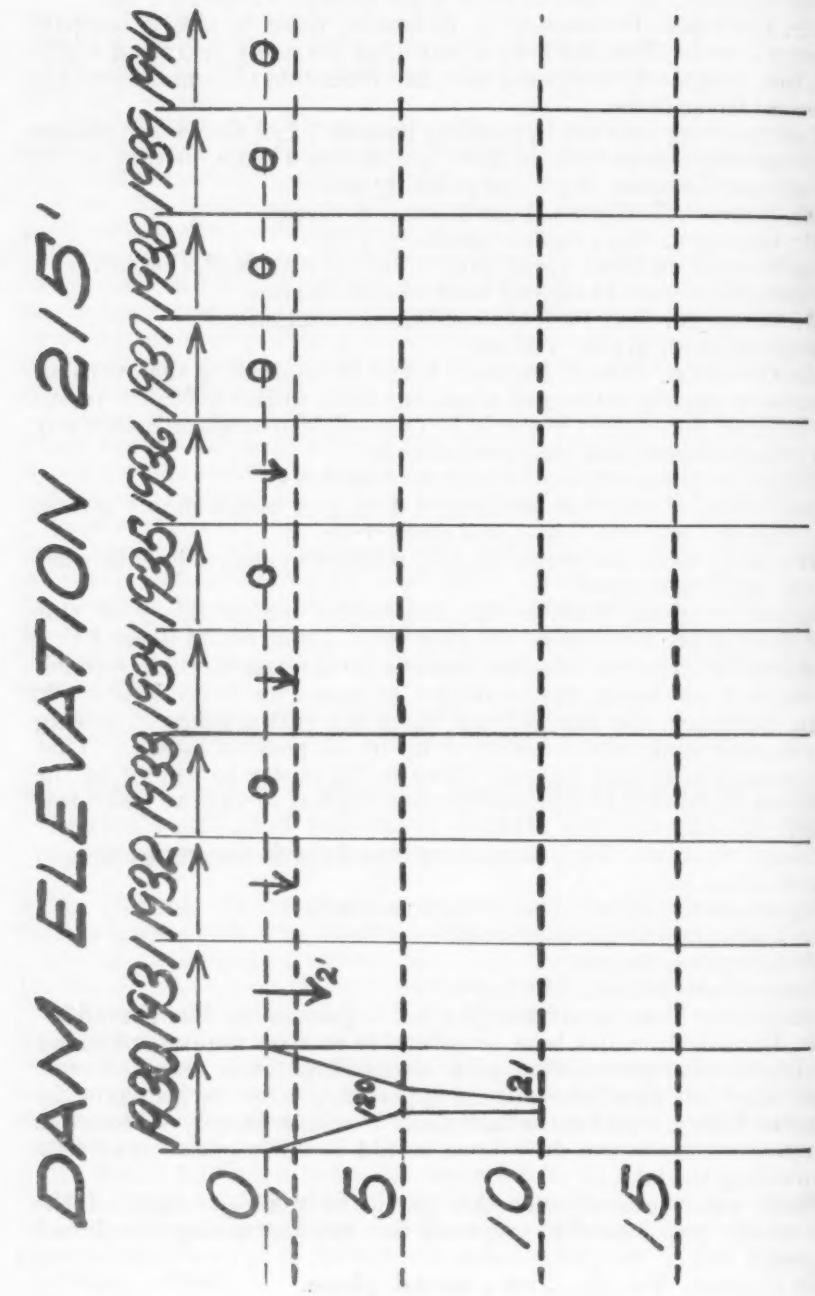
Mr. LEVIN. I wonder if I might ask a question of Mr. Birrell?

Mr. Birrell, there has been considerable fear on the part of many people that the construction of a River Bend Dam and Reservoir would eliminate great recreational opportunities for the people in the Potomac Valley, because the lake itself would be largely inaccessible to recreation, since the drawdown would leave extensive mud flats surrounding the lake.

Would you please discuss this particularly in the light of the data which you recently prepared for me concerning the broad program?

Mr. BIRRELL. Yes, sir. Just a second, please.

You are referring to these charts which I had prepared?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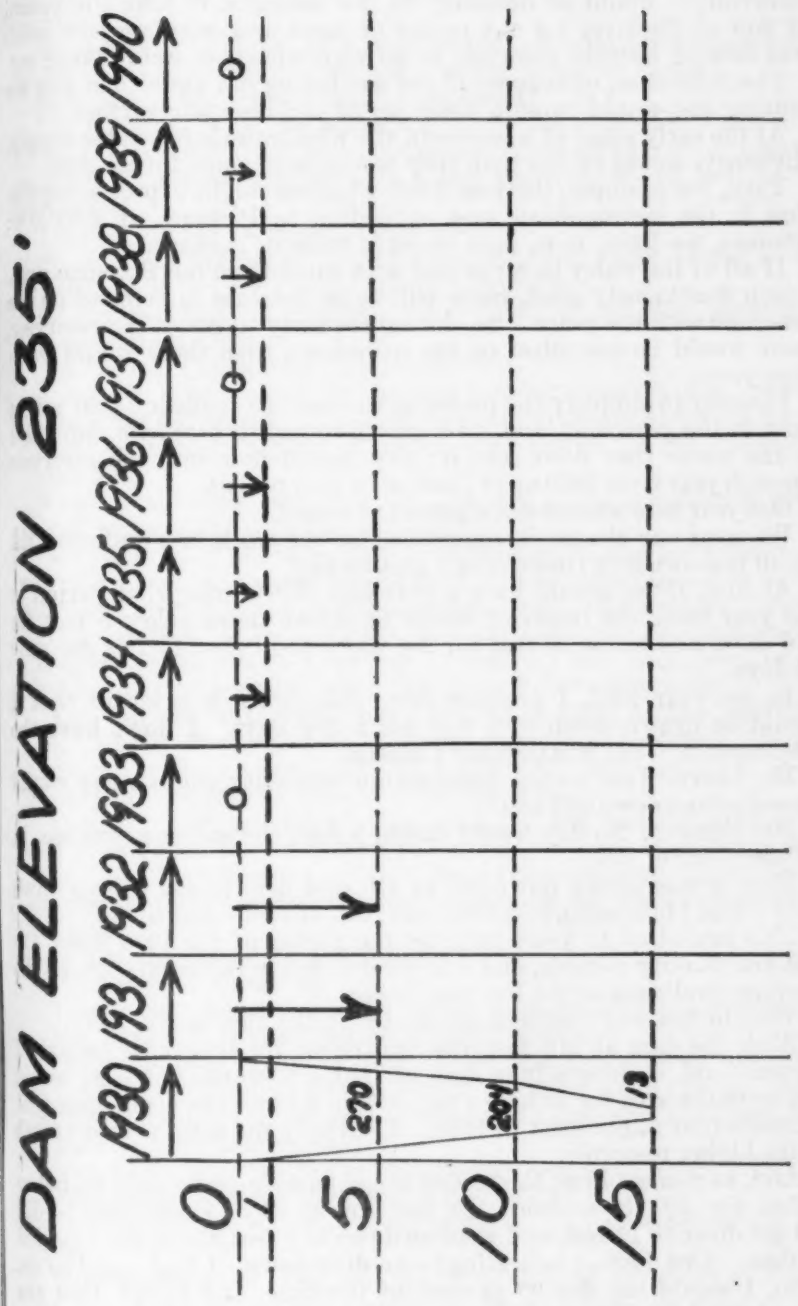
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1934
1935
1936
1937
1938
1939
1940
0
5
10
15
270
204
13

In order to show what the effect of the operations would be on the reservoir, it would be necessary to, for example, to take the record of flow of the river for any period of years and calculate how much was flowing into the reservoir to go with what you were taking out.

The difference, of course—if you are taking out more than you are putting in—would cause a lowering of the reservoir surface.

At the early stage of a reservoir, the withdrawals for water supply, obviously, would be less than they would be at some future date.

Take, for example, the year 2000, when we might expect a population in the metropolitan area, according to Pickard, of 4,800,000; whereas, we have, now, only about 2 million, perhaps.

If all of the water to serve that area came from the Potomac area, which it obviously must, there will be an increase in demand on the reservoir with the years. So, during the early stages of the reservoir, there would be less effect on the drawdown than there would be in later years.

In order to simplify the problem, we took the condition that might exist in the year 2000, and, on a month-to-month basis, we applied it to the water that flows into it; that would flow into the reservoir for each year from 1930 up to 1940—a 10-year period.

One year here was the worst period of record.

We used our electronic computers for the work involved, and the result is shown here [indicating], graphically.

At first, if we should have a year like 1930 during that period in the year 2000, the reservoir would be drawn down below 5 feet for 270 days, and below 10 feet for 204 days, and below 15 feet for only 13 days.

In the year 1931, I presume from this figure it is meant that it would be drawn down to 5 feet for a few days. I don't have the specific data. But it is possibly a month.

Mr. LEVIN. That means, interpreting your data, that no day would exceed a drawdown of 5 feet?

Mr. BIRRELL. No day would exceed 5 feet, the average, you see, in all years except 1930.

Here it was drawn down not at all; and here it was drawn down only 1 foot [indicating]—1 foot—no feet—1 foot—and so on.

This period of 10 years includes the period of the 1936 flood, the wet and the dry periods, and I think it is fairly representative of the average conditions on the Potomac River.

This, by the way [indicating], was with the dam at 235 feet.

With the dam at 215 feet, the drawdown for this same period of record—and, incidentally, a dam of that size would not last, would not serve the area for as long a period—so we took the conditions that existed—that might exist in 1980. Relatively the same period of life as the higher reservoir.

And, as you see here, the record is comparable and would be below 5 feet for 120 days—below 10 feet for 21 days [indicating]—did not get down to 15 feet, and went on down to 2 feet, there, for a period of time. One foot—[indicating]—no drawdown—1 foot—and so on.

So, I would say for 90 percent of the time, and better, that the drawdown in the reservoir for two-thirds of the life of the reservoir certainly would be very slight—not more than 1 or 2 feet at the most—depending on the condition of the reservoir.

Of course, as you extend the life or take a condition at the extreme end of the period, that might be accentuated somewhat, but only very occasionally.

Mr. LEVIN. Could you give us some idea of what these drawdowns might mean in the way of exposure to the reservoir banks?

How many feet wide would be supposed?

Mr. BIRRELL. Well, the average slope in the reservoir or the slope of the banks varies from very precipitous slopes, one to one, or greater, to some flat slopes, and possibly 1 foot down by 5—10 feet, on the horizontal.

I would say the average is about 1 to 5.

So, a 5-foot drawdown would mean that the water would be out 25 feet; or, if it were 1 to 10, it would be 50 feet.

Of course, where your slopes are very much steeper, why, it would be correspondingly less.

Mr. LEVIN. Thank you very much.

I wonder if you could just answer another question very briefly?

The other day one of the witnesses questioned the need for—I believe he said—a 2 years' supply of water being stored for the District of Columbia.

Could you briefly state how the capacity of the reservoir is determined to meet the anticipated needs?

Mr. BIRRELL. Yes, the common engineering practice for waterworks engineers generally accepted is a very simple procedure: You simply take the worst period of record of extreme flow, which, on the Potomac River, occurred in the year 1930, and, starting at the beginning of the drought period, you keep adding successively the daily flows, or add up the total amount of water that flowed down the river.

You compare that with your expected demand at any particular time, usually at the end of 50 years, which is the normal life of a reservoir or the economic life of a reservoir; and, on a day-to-day basis, you take the difference. Just like a bank.

You keep putting money in the bank and you keep drawing it out, and if you draw out more than you put in, why, the bank sends you a note. But the difference between those two represents the amount of storage that you require to serve the purpose for which the reservoir is built.

Is that the answer to your question?

Mr. LEVIN. I think so.

Then it is a rational method rather than an arbitrary method?

Mr. BIRRELL. It is an engineering calculation.

Representative HYDE. Is your report going to give us—or, rather, is your survey going to give us a rather detailed report on the relative merits of the dams on the main stream of the Potomac and those on the tributaries and headwaters?

You know that debate has been raging here as to which is the most advisable and most useful, the most economical.

Is your survey—is this survey going to give a report on the question?

Colonel SUMNER. Yes, we are investigating everything; that is, we are investigating the small—the headwaters—the main streams, and are making comparisons and will develop various types of solutions to the problem to determine which might be the most effective

or the most desirable from various points of view, including the economic point of view.

Representative HYDE. Thank you.

Do you have a question, Mr. Gutheim?

Mr. GUTHEIM. Just one further question, Colonel Sumner.

In the plan of survey report, table 1, there are a series of localities enumerated with the problems that appear in each—this is at page 17.

The two cities farthest down the Potomac—Alexandria, on the Virginia side, and Oxon Run, on the Maryland side. Is that correct, or are there any tidewater cities farther down?

Colonel SUMNER. You mean are there any in this list, or what?

Mr. GUTHEIM. Perhaps I can ask the question a different way:

On Wednesday afternoon, the committee heard a statement from Representative Lankford, representatives of the Mount Vernon Estate, and several people from the vicinity of Piscataway Creek on the south side near Accokeek, testify as to the extremely polluted condition of that portion of the river and express the hope that some relief could be provided. The burden of their complaint was that they appeared to have been neglected in many of the surveys that had been made of the Potomac River; and I am curious to know whether their complaints have reached your attention.

Colonel SUMNER. If they had been neglected before, I will see that in this study they are not.

This list of problem areas here are simply things that have been brought to our attention at the time this table was prepared, and this is not the result and is not the final study by any means, and we expect to take the basin throughout.

Mr. GUTHEIM. Thank you.

I think it would be well, Mr. Chairman, if this survey report were introduced into the record.

Representative HYDE. Thank you very much, Colonel.

The report will be inserted in the record at this point.

(The report referred to is as follows:)

PLAN OF SURVEY REVIEW REPORT, POTOMAC RIVER AND TRIBUTARIES, MARYLAND, VIRGINIA, WEST VIRGINIA, AND PENNSYLVANIA

United States Army Engineer District, Washington, Corps of Engineers, United States Army, Washington, D. C.

1. SUMMARY

A review of the report on the Potomac River and tributaries was directed by resolution of the United States Senate Committee on Public Works, adopted January 26, 1956. The review will determine whether modifications of the recommendations contained in House Document 622, 79th Congress and other appurtenant references is advisable at this time looking toward the preparation of a comprehensive plan for control of floods and the development and conservation of water and related resources of the basin with major emphasis on present and future water supply and pollution abatement. The report will also give some extra emphasis to flood control and recreation aspects of the program:

This report will present a plan and a limited number of alternate plans for the development of the water resources of the Potomac River Basin for all beneficial uses present and future. It will present in survey scope detail, insofar as possible, all structural and nonstructural measures recommended to implement the plan, whether this implementation is by Federal, State, or local agencies.

The investigation for the report will be carried only to the point where reasonable conclusions can be reached. Excessive refinement is not planned. All benefits claimed will be reasonable and capable of substantiation.

The plan will be revised as necessary during the cource of the study.

It is presently contemplated that the preparation of the report will cover development in two categories.

(1) A plan of immediate action to cover the next 50 years.

(2) A plan of development to meet the needs from 50 years hence to and including 200 years from now.

Each will delineate the work contemplated for accomplishment at Federal, State, and local cost.

Full development of the basin will be evaluated.

The report will recommend authorization for Federal construction of, or participation in, projects in the overall plan for the development of the water resources of the Potomac River basin for which there are immediately foreseeable needs, and will make appropriate apportionment of the costs of the recommended projects between Federal and non-Federal interests.

The work will be coordinated with the Interstate Commission on the Potomac River Basin, the National Capital Region Planning Council and other State and Federal agencies concerned to insure full consideration of all views and requirements. Based upon the assumption that adequate funds are made available for efficient prosecution of the work, the study can be completed in June 1961. The estimated cost of the review report will be in the general magnitude of $1,650,000. This estimate is subject to revision to reflect revised estimates from cooperating agencies, and contains only those funds budgeted for cooperating agencies by the Corps of Engineers.

The report will also suggest the establishment of a non-Federal organization to carry out the non-Federal responsibilities under the comprehensive plan.

2. AUTHORITY

(*a*) The study will be prepared in compliance with the following resolutions pertaining to a restudy of the entire basin:

(1) Resolution by the United States Senate Committee on Public Works, adopted January 26, 1956. Requested by Senator J. Glenn Beall, of Maryland, Senator M. M. Neely, of West Virginia, and Senator W. Morse, of Oregon.

(2) Resolution by the United States Senate Committee on Public Works, adopted September 14, 1955. Requested by Senator Prescott Bush, of Connecticut.

(3) Resolution by the Committee on Public Works of the House of Representatives, adopted August 16, 1950. Requested by Representative J. Glenn Beall.

(*b*) The initiation of the study by the Washington District, Corps of Engineers was directed by first endorsement, Office, Chief of Engineers, dated February 1, 1956, to letter of United States Senate Committee on Public Works, dated January 26, 1956.

In addition, the following resolutions will be combined with this overall study.

(1) Big Wills and Little Wills Creeks for flood control at Hyndman, Pa., July 23, 1946, House Flood Control Committee.

(2) Potomac River and tributaries for flood control at Williamsport, Md., August 17, 1949, House Public Works Committee.

(3) North River and tributaries for flood control, October 15, 1949, House Public Works Committee.

(4) South Branch of Potomac River and tributaries for flood control, January 20, 1950, Senate Public Works Committee.

(5) South Branch of Potomac River and tributaries for flood control in Grant, Hardy, and Pendleton Counties, June 27, 1950, House Public Works Committee.

(6) Potomac River and tributaries, Maryland, Virginia, West Virginia, and Pennsylvania, for flood control, August 16, 1950, House Public Works Committee.

(7) Potomac River and tributaries for water supply to Westernport, Md., July 29, 1953, House Public Works Committee.

(8) Potomac River and tributaries for water supply to Westernport, Md., March 20, 1953, Senate Public Works Committee.

(9) North Branch of Potomac River and tributaries, for flood control, water supply, and allied purposes, July 29, 1955, House Public Works Committee.

(10) Potomac River, Va., Md., W. Va., and District of Columbia, in area affected by hurricane flood of August 1955, for flood control and allied purposes, September 14, 1955, Senate Public Works Committee.

(*c*) Copies of the above-mentioned resolutions are included in the appendix.

3. BRIEF RÉSUMÉ OF EXISTING CONDITIONS AND PROBLEMS

(*a*) *Navigation.*—Studies pertaining to navigation in the tidal areas of the Potomac Basin are covered by existing projects and unless affected by regulated streamflow or involving salinity problems will not be considered in this review. However, navigation in the nontidal areas which may develop as a result of proposed improvements would be considered in connection with the studies. Maintenance dredging needs would also be studied in this connection.

(*b*) *Flood control.*—Flood protection measures have been provided by the Corps of Engineers at Anacostia River Basin, D. C. and Md., Cumberland, Md., and Ridgeley, W. Va., Bridgewater, Va., to a limited degree at Washington, D. C., and several small farm leveed areas along the South Branch of Potomac River and along the North River, a tributary of the Shenandoah River. The Savage River Dam, completed in 1952, furnishes limited flood protection along the North Branch of the Potomac River between Luke, and Cumberland, Md. In addition, at the present time, the Soil Conservation Service has several projects in various stages of development, as follows:

South River: Several structures, almost all completed.

New Creek: Planning completed and one structure completed.

South Fork of South Branch: Projects are in the work plan stage.

Little Brushy Creek near Berkeley Springs: Most of the structures completed.

The remainder of the accomplishments consist of minor work in various stages of investigation and planning in several small watersheds of the basin.

Flood problems exist throughout the basin. The recent floods of October 1954 and August 1955 caused substantial damages in the basin. Four basic types of damage areas are involved: (1) urban areas, (2) agricultural areas, (3) riverfront recreational developments, (4) highway and railroad damage. A list of communities with known flood problems is given in table 1.

(*c*) *Water supply.*—The growth of the population, industrial capacity, and agriculture of the basin has begun to approach the limit for which the available sources in their present state of development can furnish water. The demand for additional water exists in many areas of the basin but is particularly acute in the Washington metropolitan area where the supply of water for domestic and other uses is largely the responsibility of the Corps of Engineers, and in the North Branch area for industrial growth.

(*d*) *Pollution abatement.*—The pollution of the Potomac has become a problem of national concern. This pollution varies from the mine wastes which dominate the problem in the upper North Branch to municipal wastes most critical in the metropolitan area. The control of pollution is necessary to maintain the stream, as a source of water supply and for recreational purposes, and for its esthetic values.

(*e*) *Irrigation.*—The rapid growth of irrigation in the Potomac Basin has developed a need for water in many agricultural regions of the basin. Its effect upon low river flows imposes a threat to the river as a dependable source of water supply.

(*f*) *Recreation.*—The growth of the population, particularly the urban population, has steadily increased the pressure on the existing recreation facilities. To furnish the recreation facilities needed today and for the increased population of tomorrow, extensive development, particularly for water recreation, is necessary.

(*g*) *Fish and wildlife.*—Development of these resources, particularly the development and improvement of sport and commercial fishing and of the shellfish industry, are a problem of this basin.

(*h*) *Hydroelectric power.*—There is very little developed hydroelectric power in the Potomac Basin, and its Federal development is largely opposed except by the rural electric cooperatives.

(*i*) *Salinity intrusion.*—There is no major problem due to salinity intrusion in the lower Potomac at this time. However, further development of navigation facilities, industrial water supplies from the lower Potomac, and depletion of the natural low flow may increase this problem.

4. IMPROVEMENTS DESIRED BY LOCAL INTERESTS

(*a*) *Water supply*

(1) The establishment of a dependable water supply for the anticipated growth of the Washington metropolitan area.

(2) The maintenance of a dependable minimum flow in excess of present low flows, in the North Branch for industrial water supply.

(3) Possible alternate or additional water sources for the communities indicated in table 1.

(4) A sustained dependable water supply for supplemental irrigation.

(*b*) *Pollution abatement*

(1) Pollution abatement in the Washington metropolitan area to maintain water quality suitable for domestic water supply, to remove health hazards and nuisance conditions, and allow recreational uses of the river.

(2) Pollution statement abatement in the North Branch area to improve the area as a source of industrial water supply and permit the development of a sport fishery and other recreational uses.

(3) Pollution abatement in the rivers at the communities indicated in table 1.

(*c*) *Flood control*

(1) Protection of urban areas in the North Branch by the construction of reservoirs, local protection works, channel improvements, or combinations thereof.

(2) Protection of Williamsport, Md.

(3) Protection in the Big and Little Wills Creek area.

(4) Protection in the drainage area of the North River, a tributary of the South Fork of the Shenandoah.

(5) Protection in the drainage area of South Branch of the Potomac River.

(6) Protection for Washington, D. C. with special emphasis on the Georgetown waterfront and the southwest redevelopment area and other areas known to have acute flood problems.

(7) Protection of Front Royal, Va.

(8) Flood protection for Forest Heights and other areas in Prince Georges County, Md.

(9) Flood protection for Fairfax County and Alexandria, Va.

(*d*) *Recreation*

(1) Provision for recreational facilities at planned reservoirs.

(2) Improvement of water sport areas and sport fishing.

(3) Reservation of large areas for wilderness-type recreational use.

(*e*) *Hydroelectric Power*

(1) Development of hydroelectric power on the Potomac for the benefit of rural-electric cooperatives.

5. PERTINENT DATA

(*a*) *Topographic data.*—Topographic data for the study areas are available from the following sources:

(1) USGS quadrangle sheets, scales 1:24,000 and 1:62,500. Specific areas desired are indexed on the index map prepared for this purpose by the United States Geological Survey.

(2) Army Map Service charts, scales 1:25,000 and 1:50,000. Specific maps required are obtained by reference to United States Map Catalog as published by the Army Map Service, Corps of Engineers, United States Army. The areas concerned herein are covered in 1:25,000 scale indexes on pages 35 and 43 of the above catalog. In scale 1:50,000 these areas are covered on pages 7 and 15 of the above catalog.

(3) An additional index of pertinent charts is listed on plate 8 of "Plates to Accompany Survey Report on Potomac River and Its Tributaries," as published by Washington district office, Corps of Engineers, April 30, 1944. In addition to AMS and USGS charts referred above, sources listed herein

are USED "308" Survey, scales 1:6,000 and 1:12,000, and USED dam site surveys for selected areas, scale 1:600 and 1:1,200.

(4) United States Coast and Geodetic Survey Charts Nos. 557 and 560. Scale, 1:40,000.

(5) For certain selected prospective dam sites in the basin, plane table survey sheets prepared on scale of 100 feet to the inch, with 5-foot contour intervals.

(*b*) *Hydroelectric data.*—Sources of hydroelectric data to be used in the survey report for the Potomac River Basin include the following:

(1) Surface water records: (*a*) Stream flow data: United States Department of the Interior, Geological Survey: District office, College Park, Md.; district office, Charlottesville, Md.; district office, Charleston, W. Va.; district office, Harrisburg, Pa.

(*b*) Reservoir storage data:

(1) Department of Geology, Mines, and Water Resources, State of Maryland.

(2) Sanitary Engineer's Office, District of Columbia.

(*c*) *Climatological resources.*—Information obtained United States Department of Commerce, Weather Bureau.

(1) Hydrological Service Division, Hydrometerological Section.

(*a*) "A preliminary report on the maximum possible precipitation over the Potomac and Rappahannock River Basins," dated July 24, 1943.

(*b*) Second endorsement to letter Washington district office to NAD, February 8, 1956. "Review of Preliminary Report on the Maximum Possible Precipitation over the Potomac and Rappahannock River Basins."

(*c*) Letter United States Weather Bureau, Hydrometeorological Section, to A. L. Cochran, office, Chief of Engineers, dated August 8, 1956, Review of portion of report "A Preliminary Report of Maximum Possible Precipitation Over the Potomac and Rappahannock River Basins."

(*d*) Hydrometeorological Report No. 33 (April 1956), "Seasonal Variations of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24, and 48 hours."

(e) Technical paper No. 15: Maximum Station Precipitation for 1, 2, 3, 6, 12, and 24 hours—Part IV, part VIII, part XVI, part XVIII.

(2) Weather Records Processing Center, Chattanooga, Tenn.: Monthly Climatological Data (by States).

(3) National Weather Records Center, Asheville, N. C., Hourly Precipitation Data (by States).

(*d*) *Geological Data.*—Geological data for the report is available from sources listed below. It should be noted that geological data presently available is probably insufficient for our requirements, and must be supplemented by additional borings and other similar information.

(1) Survey Report on Potomac River and Its Tributaries.

(2) House Document No. 101, dated June 10, 1933, Potomac River and Tributaries, Including Occoquan Creek.

(3) Records of borings performed.

(4) Geological data for each State concerned. Volumes published by the States themselves are available for coverage in all cases on a statewide basis or (in some States) on an individual county basis.

(5) Records of previous geological studies by other public agencies.

(*e*) *Engineering data.*—Engineering data for the report are obtainable from previous reports and studies, including,

(1) Potomac River Survey Report, dated April 30, 1944.

(2) House Document No. 101 and appendixes, dated June 10, 1933, Potomac River and Its Tributaries, including Occuquan Creek.

(3) Accepted engineering standards, including Engineering Manual for Civil Works as published by the Office, Chief of Engineers, United States Army.

(*f*) *Economic data.*—Economic data for the report will be derived from:

(1) Studies presented in the Survey Report on Potomac River and Its Tributaries, House Document No. 622, dated April 30, 1944.

(2) House Document No. 101, with appendixes, dated June 10, 1933, Potomac River and Tributaries, including Occoquan Creek.

(3) Report to the President's Water Resources Policy Commission (on the Potomac River Basin).

(4) Studies currently underway by personnel of the Washington district office relative to land management, irrigation, pollution control, flood control, and so forth.

(5) Studies now in progress by other public agencies covering monetary aspects of certain phases of the program. These agencies include Public Health Service and Fish and Wildlife Service of the Department of Health, Education, and Welfare and Department of the Interior, respectively.

(*g*) *Additional data.*—Additional data will be necessary in the proper development of this report. These data include, but are not limited to, the following:

(1) Office study for prospective dam sites, now in progress in this office. The studies will eliminate obviously unsatisfactory sites and serve to point out sites on which additional study is desirable.

(2) Field surveys and studies on selected sites remaining after elimination of unsatisfactory sites as stated in (1) above.

(3) Foundation and geologic studies by this office and other agencies as necessary for determination of subsurface conditions at promising sites.

(4) Miscellaneous other data, such as aerial photographs, surveys of areas for local protection works, etc.

These will be investigated where necessary in sufficient detail to permit a monetary evaluation of benefits and costs.

6. ELEMENTS OF STUDY

(*a*) *Report preparation*

The physical division of the report will be as follows:

(1) Interim Report on the North Branch of the Potomac River above Cumberland.

(2) Progress reports will be furnished when, in the opinion of the reporting officer, they are needed and will serve a useful purpose.

(3) Interim reports recommending individual self-contained projects which can be justified on the strength of local benefits prior to the completion of the comprehensive plan.

(4) The comprehensive basin report with appendices.

(*b*) *Study phases*

In general this study will be divided into four phases.

(1) Basic data: The collection and evaluation of basic data, previous reports and references.

(2) Needs: The development of the requirements of the area for water supply, pollution abatement, flood control, recreation, irrigation and hydroelectric power, with special emphasis on the development of such requirements for the projected future population and economic growth of the area.

(3) Capabilities: The inventory and study of the water resource potential available in the area. A study of available reservoir sites, of pollution abatement measures and of potential areas for local flood-protection works.

(4) Comprehensive plan: The development of the best plan, and a limited number of alternate plans to fulfill the area requirements with the area capabilities. These plans will be developed to meet area requirements first of the near future and secondly of the more distant future.

(*c*) *Study elements*

Specifically, this study by the Corps of Engineers will be comprised of the following elements:

(1) Development of the hydrologic design criteria for the basin including the establishment of maximum probable and standard project floods at critical points throughout the basin, development of frequency curves and determination of safe yield quantities for representative streams of the basin.

(2) North Branch of Potomac River above Cumberland. This study will develop a complete interim report for this area containing references to public hearings, basic data, problems for investigation, plans of improvements, estimates of the costs, conclusions and such recommendations as can be made, based on the study of this area only.

(3) Washington metropolitan area, needs with special emphasis on water supply, pollution abatement, recreation and flood control. This portion of the study will include economic and population projections for the Washington metropolitan area and its demands on the water resources of the basin.

(4) Determination of water resource requirements for the basin, exclusive of the North Branch and metropolitan areas. This portion of the study will de-

velop the local needs for water supply, pollution abatement, irrigation, flood control and other uses based on population and economic projections.

(5) An inventory of all potentially useful dam sites in the basin, regardless of size. A field reconnaissance of these inventoried sites will indicate those sites with sufficient potential for further study. Detailed studies of those sites which could be included in a development plan will then be made, to include site surveys, foundation explorations, preliminary designs, and cost and operation studies.

(6) Study of the urban areas, to develop plans, costs, and benefits for local flood protection works. Consideration will be given where appropriate to initiation of construction under Public Law 685.

(7) Development of alternate plans. Various schemes of basinwide development will be studied, to include large reservoirs, small reservoirs, local flood-protection works, watershed treatment programs and plans for all other water resources development.

(8) Selection of a recommended plan and a limited number of alternates, with full development of details and economic justification.

(9) Preparation of final report and appendices.

(*d*) *Special studies*

(1) Department of Agriculture:

(a) Soil Conservation Service: Will determine its program for the basin and the relation of its program to Corps of Engineers planning; will coordinate all activities of agencies of the Department of Agriculture in connection with this report; will develop, using pilot plans and existing work plans, a watershed treatment program to minimize runoff; will coordinate with the corps and other agencies conducting economic surveys; will furnish data on existing agricultural and other rural water-use rates; will prepare a forest management plan for the basin; will present views on reforestation in proposed project areas; will evaluate the reforestation program in conjunction with the watershed treatment programs; will determine present and future economics of farming including projections of acreage and land values; will coordinate with the corps on the study of irrigation requirements and projections. (will coordinate with States).

(2) Department of Commerce:

(a) Office of Business Economics: Will in cooperation with other sections of the Department of Commerce prepare an economic base study of the basin including projections of the growth of the region and subregions in terms of such overall indicators as population, employment and personal income.

(b) Coast and Geodetic Survey: Will furnish information on primary geodetic control and information on sea level changes.

(c) Weather Bureau: Will prepare studies on maximum possible and standard project rainfall; will furnish meteorological data and establish additional raingage stations as needed; will cooperate with the corps on flood warning studies.

(d) Bureau of Public Roads: Will prepare studies on highway relocations and cost; will cooperate with the corps in the design of highway crossings over dams. (Will coordinate with States.)

(3) Department of the Interior:

(a) Geological Survey: Will under the cooperative program operate and maintain stream gaging stations and furnish data on streamflow and chemical water quality; will determine the groundwater resources of the basin; will in cooperation with Department of Agriculture obtain data on sedimentation within the basin. (Will coordinate with States.)

(b) Fish and Wildlife Service: Will inventory the fish and wildlife resources of the area and determine the effect of water resources development; will make recommendations for operations to maximize fish and wildlife benefits and assign monetary values to such benefits. (Will coordinate with States.)

(c) National Park Service: Will in cooperation with the corps and other interested agencies, develop a recreation plan for the area; will evaluate the recreational aspects of project areas. (Will coordinate with States.)

(d) Bureau of Mines: Will collect information on existing mining activities in the basin and study the effect of water resources development on mining; will determine the effect of future mining on water resources particularly on water quality. (Will coordinate with States.)

(4) Department of Health, Education, and Welfare:

(a) Public Health Service: Will make studies pertaining to pollution abatement, water supply, public health and sanitary water quality, to include pollution dilution requirements; will determine monetary benefits from pollution abatement by proper treatment, value of water for industry including processing and cooling water benefits and municipal water supply benefits. (Will coordinate with States.)

(5) Federal Power Commission: Will determine the power potential of the basin and the present and future market for and value of such power; will collaborate with the corps in studies pertaining to power developments, costs, and benefits.

(6) Atomic Energy Commission: Will determine the probable future impact of atomic developments in the field of power, stream sanitation, and the requirements for the disposal of atomic waste.

(7) Interstate Commission on the Potomac River Basin: Will coordinate with its efforts with the studies by the corps and other Federal agencies.

(8) National Capital Regional Planning Council: Will coordinate its planning in the metropolitan area of Washington with pertinent Corps of Engineers studies.

(9) Advisory Group for the Potomac River Basin: Will serve as contact point with the States and interstate bodies; will coordinate a study by the States to determine the organizational structure required to carry out water resources development in the Potomac Basin including studies pertaining to legislation, enforcement, and financing.

7. COOPERATION AND COORDINATION REQUIRED FROM FEDERAL AGENCIES AND LOCAL INTERESTS

In order to prepare a comprehensive plan for control of floods and the development and conservation of the water and related resources of the basin, assistance will be obtained from the following Federal and local agencies. The scope of their studies is shown in greater detail in paragraph 6c.

(*a*) United States Department of Agriculture, for (1) studies on the effect of watershed management and soil conservation practices on low and flood flows; (2) an inventory of agriculture and projection of agricultural practices; (3) a study of forests as they relate to the program; (4) summary of work accomplished by Soil Conservation Service.

(*b*) United States Department of Commerce, for (1) data on population, commerce, transportation, and industry with reference to their water requirements, and projections of these requirements into the future; (2) studies on highway relocations and values; (3) data and studies on the weather, climate, and associated phenomena.

(*c*) United States Department of the Interior, for (1) basic data and evaluations of surface and ground-water flow and quality; (2) effects of water resource development on fish and wildlife; (3) development of plans for recreational facilities and evaluation of proposed project areas; (4) information pertaining to existing mining activities in the basin and the effects of future mining on water resources.

(*d*) United States Department of Health, Education, and Welfare, for investigation of water supply and quality, pollution and dilution requirements and benefits pertaining thereto.

(*e*) Federal Power Commission, for (1) the determination of the power potential of the basin and the market and value for such power; (2) collaboration in the studies pertaining to power developments, costs, and benefits.

(*f*) Atomic Energy Commission for the determination of the probable future impact of atomic developments on water resources planning.

(*g*) Advisory Group for the Potomac River Basin:

Col. George B. Sumner, district engineer, Washington District Corps of Engineers, United States Army, First and Douglas Streets NW., Washington, D. C., executive secretary
Dr. Raymond V. Long, Director, Department of Conservation and Development, Commonwealth of Virginia
Mr. A. J. Sommerville, department of forestry and water, Commonwealth of Pennsylvania
Dr. David Auld, Director of Sanitary Engineering, District of Columbia
Mr. Ellis S. Tisdale, Director, Interstate Commission on the Potomac River Basin

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Mr. Paul Watt, Director, National Capital Regional Planning Council
Mr. H. Winship Wheatley, Hyattsville, Md., member, Maryland State senate
Mr. Earle Andrews, Governor's representative, Berkeley Springs, W. Va.

(*h*) Upper Potomac River Commission (North Branch only), P. O. Box 90, Cumbeeland, Md.: John J. McMullen, chairman; Owen Hitchins, treasurer; Lawrence M. Fraley, member; Marshall H. Towers, auditor; Julian G. Patrick, supervisory engineer.

8. PLANS FOR AND RESULTS OF PUBLIC HEARINGS

(*a*) Four public hearings covering the water problems in the North Branch Basin above Cumberland, Md., were held in April 1956, in Bayard and Keyser, W. Va., and Westernport and Kitzmiller, Md. Testimony disclosed flood problems on Buffalo Creek at Bayard, W. Va., Nydegger Run at Gorman, Md., several communities along Georges Creek in Maryland, on the North Branch at Gorman, Blaine, Piedmont, and Keyser, W. Va., and Shallmar, Kitzmiller, Luke, and Westernport, Md., and on New Creek at Keyser. Pollution of the streams in the basin from municipal, industrial, and mine wastes, and inadequate low flows were considered major problems.

The improvements desired by local interests are local flood protection for Bayard, Blaine, Piedmont and Keyser, W. Va.; Kitzmiller and Westernport, Md., the reduction of municipal, industrial and mine wastes, and the construction of storage reservoirs on the North Branch and tributaries upstream of Luke, Md., for flood control, low water supplementation and recreation purposes. There was no opposition to reservoirs in the area and they received strong support from municipal, industrial and conservation interests.

(*b*) Hearings covering the problems of the area between Harpers Ferry, W. Va., and the Washington metropolitan area inclusive were held June 25–27, 1957 at Rockville, Md., Fairfax, Va., and Washington, D. C. The focal point of the meetings was discussion of a dam at Riverbend, a dam proposed in the Potomac River Report of 1946 (H. R. 622, 79th Cong., 2d sess.). Favorable recommendation for the dam and its multiple-purpose features came from the Federal, some State and local public agencies which are normally concerned with water supply, pollution abatement, and related fields, and from some civic groups and individuals. Strong support for a multiple-purpose project on the Potomac came also from rural electric power cooperatives.

Opposition to Riverbend and the overall Corps of Engineers program for development was most prevalent among those groups and individuals who wish the basin left as it is for recreational purposes, and among the farmers and landowners who would be flooded out by the reservoir. Opponents attacked all phases of the benefits accruing from the dam.

Some of the principal arguments of the opponents of the Corps of Engineers program are summarized as follows:

(1) Riverbend is a menace to Washington in view of the threatening military situation, as its destruction would unleash a wall of water to destroy Washington, D. C.

(2) A series of small dams in the headwaters would be a better solution, because:

(*a*) Unpopulated land would be used, at low cost, with no danger of destruction to large cities, and no valuable farmland would be removed from tax rolls, as in the case of Riverbend and others.

(*b*) Destruction of 1 dam would not destroy the entire water supply in 1 blow.

(*c*) Riverbend would become a "stagnant lake of sewage" due to sewage dumped into it from the expanding population of Hagerstown and Frederick, Md.

(*d*) Riverbend would ruin scenic and esthetic land values due to creation of large mud flats during drawdown.

(*e*) Riverbend would not aid in pollution abatement.

(*f*) Water can be obtained competitively from desalting salt water or distillation of sewage.

(*g*) Riverbend does not help the farmers.

The salient feature of the hearings were the diametrically opposed points of view among sportsmen, conservationists, farmers, and other groups. Arguments both for and against were heard from different factions in each of these groups.

(c) Additional public hearings will be scheduled during fiscal year 1958 in the area of the South Branch and the Potomac upstream of Harpers Ferry, W. Va.

9. WORK SCHEDULE

Assuming funds are available to permit efficient prosecution of the work, the elements of the investigation will be accomplished in accordance with a schedule approved by the Office of the Chief of Engineers.

10. SCHEDULE FOR ASSISTANCE AND REVIEW

The estimated dates for completion of those sections of the study to be included in separate reports are:

(a) North Branch, March 31, 1958.
(b) A progress report of preliminary scope, June 31, 1959.
(c) Final report, June 30, 1961.

It is proposed to submit these reports to the division engineer, North Atlantic division for review and approval upon the completion of each. The assistance of the division engineer will be requested in connection with studies or formulation of policies outside of the normal functions of this office. Approval of the division engineer will be obtained prior to the initiation of work to be accomplished by Federal, State, or other agencies wherein sizable funds allotted to the study are involved.

TABLE I.—*Problem areas (in alphabetical order)*

Location	Flood control	Water supply	Pollution
Alexandria, Va.	X	X	X
Arlington Co., Va.	X	X	X
Barton, Md.		X	
Bayard, W. Va.	X		X
Bridgewater, Va.	X		
Brunswick, Md.	X		
Cacapon River	X		
Corringansville, Md.		X	
Cresaptown, Md.		X	
Cumberland, Md.		X	X
Elkton, Va.	X		X
Ellerslie, Md.		X	
Fairfax Co., Va.	X	X	X
Forest Heights, Md.	X		
Frederick, Md.		X	X
Front Royal, Va.	X		X
Frostburg, Md.		X	
Grottoes, Va.	X		X
Hagerstown, Md.		X	X
Hancock, Md.	X		
Hyndman, Pa.	X	X	
Keyser, W. Va.	X		X
Kitzmiller, Md.	X		X
La Vale, Md.		X	
Lonaconing, Md.		X	
Luke, Md.	X	X	X
Maysville, W. Va.	X		
McCoole, Md.		X	
Midland, Md.		X	
Mount Savage, Md.		X	
Moorefield, W. Va.	X	X	X
Opequon Creek	X		X
Oxon Run, Md.	X		
Petersburg, W. Va.	X	X	X
Piedmont, W. Va.	X		X
Point of Rocks, Md.	X		
Port Republic, Va.	X		X
Riverton, Va.	X		X
Rockville, Md.		X	
Romney, W. Va.		X	
Shenandoah, Va.	X		X
Timberville, Va.	X		X
Washington (metropolitan area)	X	X	X
Waynesboro, Va.	X		X
Westernport, Md.	X	X	X
Williamsport, Md.	X		
Winchester, Va.			X

UNITED STATES SENATE, COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors created under section 3 of Rivers and Harbors, approved June 13, 1902, be, and is hereby, requested to review the report on the Potomac River and tributaries in Maryland, Virginia, West Virginia, and Pennsylvania, published at House Document No. 622, 79th Congress, and other appurtenant references, in order to determine whether any modification of the recommendations contained therein is advisable at this time, with a view to preparation of a comprehensive plan for control of floods and the development and conservation of the water and related resources of the basin, with emphasis on present and future needs for water supply and pollution abatement. In connection with this study, the Corps of Engineers should coordinate fully with the Interstate Commission on the Potomac River Basin, and with the States of Maryland, Virginia, West Virginia, Pennsylvania, and the District of Columbia, and with the National Capital Regional Planning Council and other States of Maryland, Virginia, West Virginia, Pennsylvania, and the District of Columbia, and with the National Capital Regional Planning Council and other State agencies concerned to insure full consideration of all views and requirements.

DENNIS CHAVEZ.

Adopted January 26, 1956.

Requested by Senator Glenn Beall, of Maryland, Senator M. M. Neely, of West Virginia, Senator W. Morse, of Oregon.

[84th Cong., 1st sess.]

UNITED STATES SENATE, COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review previous reports on the Merrimack River, Mass., and N. H.; Blackstone River, Mass., and R. I.; Thames River, Mass., and Conn.; Connecticut River, Conn., Mass., Vt., and N. H.; Housatonic River, Conn., Mass., and N. Y.; Delaware River, N. Y., N. J., and Pa.; Susquehanna River, Pa., and N. Y.; Potomac River, Va., Md., W. Va., and District of Columbia; and intervening streams; in the area affected by the hurricane flood of August 1955, to determine the need for modification of the recommendations in such previous reports and the advisability of adopting further improvements for flood control and allied purposes in view of the heavy damages and loss of life caused by such floods.

(s) DENNIS CHAVEZ, *Chairman.*

Adopted September 14, 1955.

(Requested by Senator Prescott Bush, of Connecticut.)

COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, UNITED STATES, WASHINGTON, D. C.

RESOLUTION

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, Maryland, Virginia, West Virgina, and Pennsylvania, submitted in House Document No. 622, 79th Congress, 2d session, and prior reports, with a view to determining whether the recommendations for flood control contained therein should be modified in any way at this time.

Adopted August 16, 1950.

Attest:

(Signed) J. H. MCGANN, Sr., *Clerk.*

Requested by Representative J. Glenn Beall.

RESOLUTION

Resolution by the Committee on Flood Control of the House of Representatives adopted July 23, 1946: "*Resolved by the Committee on Flood Control of the House of Representatives*, That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act approved June 13, 1902, be and is hereby requested to review the report on the Potomac River and tributaries, published as House Document No. 622, 79th Congress, 2d session, with a view to determining whether any improvements along Big Wills and Little Wills Creeks in Pennsylvania are justified in the interest of flood control at and in the vicinity of Hyndman Borough, Pa."

COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, UNITED STATES, WASHINGTON, D. C.

RESOLUTION

Resolved September 13, 1949—824.02 (Potomac River and tributaries, vicinity Williamsport, Md.)

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, submitted in House Document No. 101, 73d Congress, 1st session, with a view to determining whether improvements for flood control in the vicinity of Williamsport, Md., are advisable at this time.

Adopted August 17, 1949.

Attest:

J. H. MCGANN, Sr., *Clerk.*

Requested by Representative J. Glenn Beall.

COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, UNITED STATES, WASHINGTON, D. C.

RESOLUTION

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, submitted in House Document No. 101, 83d Congress, 1st session, and other pertinent reports, with a view to determining whether improvements for flood control on the North River and tributaries, in Virginia, are advisable at this time.

Adopted October 15, 1949.

Attest:

[s] J. M. MCGANN, Sr., *Clerk.*

Requested by Representative Burr P. Harrison.

UNITED STATES SENATE, COMMITTEE ON PUBLIC WORKS

RESOLUTION

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report on the Potomac River and tributaries in Maryland, Virginia, West Virginia and Pennsylvania, published in House Document No. 622, 79th Congress, 2d session, with a view to determining whether improvements for flood control and allied purposes are justified at the present time with particular reference to the South Branch Potomac River and its tributaries.

Adopted: January 20, 1950.

[s] DENNIS CHAVEZ, *Chairman.*

RESOLUTION

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, submitted in House Document No. 622, 79th Congress, 2d session, and prior reports, with a view of determining whether improvements for flood control on the south branch of the Potomac River in Grant, Hardy, and Pendleton Counties, W. Va., are advisable at this time.

Adopted: June 27, 1950.

Attest:

J. H. MCGANN, Sr., *Clerk.*

Requested by Representative Harley O. Staggers.

COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, WASHINGTON, D. C.

RESOLUTION

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, Maryland, Virginia, West Virginia and Pennsylvania, submitted in House Document No. 622, 79th Congress, 2d session and other pertinent reports, with a view to determining whether improvements for flood control, low-flow supplementation, water supply, pollution abatement, and other related subjects on the North Branch of the Potomac River above Cumberland, Md., and Ridgeley, W. Va., are advisable at this time.

Adopted: July 29, 1955.

Attest:

CHARLES S. TIEVEY, *Chief Clerk.*

Requested by Representative Harley O. Staggers.

COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, UNITED STATES,

WASHINGTON, D. C.

September 1, 1950

RESOLUTION

824.02 (Potomac River and tributaries, Maryland, Virginia, West Virginia, and Pennsylvania)

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, Maryland, Virginia, West Virginia, and Pennsylvania, submitted in House Document No. 622, 79th Congress, 2d session, and prior reports, with a view to determining whether the recommendations for flood control contained therein should be modified in any way at this time.

Adopted August 16, 1950.

Attest:

J. H. MCGANN, Sr., *Clerk.*

Requested by Representative J. Glenn Beall.

RESOLUTION

821 (Savage River Dam and Reservoir, Westernport, Md.)

Resolved by the Committee on Public Works of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review the reports on the Potomac River and tributaries, Maryland, Virginia, West Virginia, and Pennsylvania, published in House Docu-

ment No. 622, 79th Congress, 2d session, with a view to determining whether any modification of the Savage River Dam and Reservoir, with respect to providing a water supply for the town of Westernport, Md., is advisable at this time.

Adopted July 29, 1953.

Attest:

/s/ ROBERT H. MCCONNELL, *Chief Clerk.*

Requested by Representative DeWitt S. Hyde.

[83d Cong., 1st sess.]

UNITED STATES SENATE, COMMITTEE ON PUBLIC WORKS

COMMITTEE RESOLUTION

821 (Savage River Dam and Reservoir, Westernport, Md.)

Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report on the Potomac River and tributaries, Maryland, Virginia, West Virginia and Pennsylvania, published in House Document No. 622, 79th Congress, 2d session, with a view to determining whether any modification of the Savage River Dam and Reservoir, with respect to providing a water supply for the town of Westernport, Md., is advisable at this time.

Adopted March 20, 1953.

/s/ EDWARD MARTIN, *Chairman.*

STUDIES IN BUSINESS AND ECONOMICS

Bureau of Business and Economic Research, University of Maryland, College Park, December 1957

POTOMAC RIVER BASIN—RESEARCH, PLANNING, DEVELOPMENT

INTRODUCTION

In offering a program for study and planning on the Potomac River Basin and its urban areas, particularly of metropolitan Washington, the staff of the bureau record the following observations:

1. The Potomac River Basin is one of the most beautiful natural areas in the United States; much of it still is unspoiled, despite pressures for sectional exploitation.

2. Metropolitan areas and their regional environments are increasingly interdependent.

3. The regional concept of planning is essential to envisage adequate programing for expanding population and to utilize the varied resources.

4. Planning is endangered by (*a*) failure to include competent specialists from all basic fields; (*b*) partial rather than complete and integrated programing; and (*c*) overlapping of officials, duplication of functions, and dilution of authority.

5. Only a comprehensive, all-inclusive plan and its enforcement will save the region from exploitation detrimental to the common interests of the general public.

DEFINITION OF THE REGION

The problem of definition

Before drawing up an outline of the factors affecting the public interest as they relate to planning of the Potomac River Basin, it is, first, essential to define the region under consideration. The problem of delimiting and defining a region is difficult, and has provided regional theorists a rich field for debate. But while speculation on the problem continues, it is essential for investigators to come to their own rough solutions of the problem of defining a region in order to deal with pressing, immediate problems.

For purposes of this study, the area drained by the Potomac River and its tributaries suggests itself as a reasonable working definition. This area lies within the political boundaries of the District of Columbia, Maryland, Virginia, West Virginia, and Pennsylvania. This larger region, of which the drainage basin is a part, has a population most recently estimated at 20,264,000,[1] or approximately 12 percent of the United States total, and a land area of 118,982[2] square miles, or almost 4 percent of the total in the United States.

This Middle Atlantic region includes as its major city the Nations' Capital, with a population of 831,000, and a metropolitan area of almost 2 million population. Geographically, the region includes a broad coastal plain which merges into the rolling, hilly Piedmont Plateau with the elevation of from 400 feet at the fall line to 1,000 feet. West of the Piedmont Plateau is the Appalachian province of ancient mountains whose many ridges are essentially parallel, running from northeast to southwest. It includes such ridges and valleys as the Blue Ridge, the Great Valley, Allegheny Ridge, and the Allegheny Plateau.[3]

The Potomac River itself is one of the great bodies of water on the eastern seaboard. With a total length of almost 400 miles, it drains a river basin of 14,500 square miles.[4] Although the character of the river varies greatly along its length, it can be broadly divided into two regions, above and below the fall line at Great Falls. Above this point are 266 miles of river draining 11,580 square miles. Below the fall line the river becomes a tidewater stretch tributary to the Chesapeake Bay. This segment of the river includes 117 miles draining 2,920 square miles and is navigable for most of its length into Washington, D. C. with a 24-foot channel.

The total volume of flow depends upon seasonal factors as well as location of the gage. A typical average volume of flow is that for the period 1930–48 as measured at Point of Rocks, Md., where the cubic feet per second reached 11,080. During the drought period, 1930–32, this was reduced almost to one-tenth with an average flow of 1,100 cubic feet per second and a minimum daily flow of 800 cubic feet per second. The maximum daily flow at Point of Rocks was 480,000 cubic feet per second.

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[1] U. S. Department of Commerce, Bureau of the Census, Current Population Reports, Population Estimates, series P–25, No. 165, Washington, November 4, 1957.

[2] Encyclopaedia Britannica World Atlas, C. S. Hammond & Co., New York, 1947, pp. VI–VIII.

[3] Collier's Encyclopedia, vol. 13, P. F. Collier & Co., New York, p. 218.

[4] Ten Rivers in America's Future, The Report of the President's Water Resources Policy Commission, vol. 2, Washington, 1950, p. 577.

Statistical and regional problems

Once the regional setting of a particular problem has been defined, a careful statistical analysis of the area is required. At this point, however, it is too often the case that the regional statistical resources are inadequate. This may be true for a number of reasons.

For administrative reasons, statistics are usually collected for political units. Political units, such as counties and States, were usually set up for historical reasons. These historical boundaries may or may not have coincided with geographical boundaries. Further, there is no reason to expect historical boundaries, geographically oriented or not, to be relevant to current problems. County units, being smaller than States, are somewhat less of a problem but not as much information is available on a county basis.[5]

Probably the most sensible way to approach the definition problem is to accept a flexible interpretation which recognizes that the definition adopted must be related to the problem under investigation. Once it has been accepted that the proper definition of the region hinges upon the factors of the problem under consideration, it must be clear that the boundary lines must be kept flexible for analytic purposes. The geographic boundaries of the drainage basin are broadly adequate for limiting the region in review. However, an essential part of the analysis includes economic factors. Given the role of transportation and communication facilities in the United States economy, economic forces are modified but not limited by geographic boundaries. For example, the northwestern part of the Potomac River Basin is probably influenced as much by economic activity in Pittsburg as by that in Washington, D. C., or Baltimore. It would be therefore unnecessary and unwise to exclude this city from the analysis simply because it lies outside of the drainage area of the Potomac.

PARTIAL APPROACHES ILLUSTRATED

Human physical ailments usually are studied by a general diagnostician who refers to specialists areas of particular concern. The objective is health for the whole man. Similar procedures are normal for a region, which should be analyzed, planned, and developed as an integral concept. Otherwise, some areas, factors, or aspects within a region may be developed to the disadvantage of the whole. A few illustrations may be cited:

1. An engineering interest is professionally uppermost in the operations of the Corps of Army Engineers in building dams, and in the United States Bureau of Public Roads in laying out roads. Neither organization is equipped to diagnose or prescribe for the whole development. But if their special programs are accepted without relation to other factors, the region as a whole may be adversely affected.

2. The magnitude of the water pollution problem has led to many suggestions of partial solutions, one of which is a proposal to flush sludge downstream with the aid of a high dam.

3. Frequently the plans for development of roads, highways, and speedways appear to be based upon the objective of moving all residents of town A to town B, and of town B to town A. Any long stretch of land without buildings, even public parks, is an irresistible attraction. And so is Federal aid.

4. Proposals for impoundment of water for supply and flood control have emphasized huge dams which would inundate large areas of land in conflict with alternative priorities.

5. The poliferation of partial and competitive approaches to the acquisition of unspoiled natural areas by private and governmental interests has forced the conservationist into the position of opposing any encroachment until a comprehensive study has been completed and publicly reviewed.

6. Interrelations of urban and regional planning and development are diversified:

(*a*) The water supply for the basin originates in four States. Pollution upstream affects downriver residents.

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[5] As an indicator of some of the many regional designations which have been attempted, the Federal Reserve districts provide an illustration. The District of Columbia Potomac River Valley includes parts of three Federal Reserve districts. Federal Reserve District No. 3 includes Philadelphia and the eastern half of Pennsylvania, together with all of Delaware and New Jersey, District No. 4 covers Pittsburgh, the western half of Pennsylvania, all of Ohio, and the eastern half of Kentucky, District No. 5 includes all of Maryland, West Virginia, Virginia, the District of Columbia, and South Carolina. The Mason-Dixon line, which is assumed roughly to divide the eastern United States into the sociological North and South, also divides the Potomac River Basin, with all except Pennsylvania south of this line.

(*b*) Heavy industrial development historically has been incompatible with basic water-resource use and recreational goals.

(*c*) Prerequisite to a highway program is a master plan for long-range regional development in all categories.

(*d*) Many recently proposed plans for Washington and the metropolitan area ignore contemporary advanced ideas on city and regional planning.

LAND USE AND RESOURCE PLANNING

Little can be accomplished in the way of planning for regional development without comprehensive study of the area in question. This investigation must consider not only the physical and topographical characteristics but must include economic, social, and esthetic factors as well. In many instances these factors are not suited for simple mechanical or quantitative comparison and analysis. It is difficult to place a monetary value on something of great social or historical importance; consequently these aspects are frequently eliminated or ignored.

The primary purpose of the land-use study is to obtain a detailed picture of present employment and potential utility of land. Once this is achieved, it provides information essential for (1) determining future land-use patterns; (2) appraising the impact of development proposals; and (3) planning for optimum land utilization consistent with other considerations.

Because the Potomac River Basin includes a major metropolitan area, the problem of studying land use becomes quite complex. Although the influence of Washington, D. C., on land use in the entire basin is quite pronounced, it is not intended that this study concentrate on urban land problems. Since planning emphasis has been placed almost exclusively upon the Washington area, an examination of the entire basin is essential to determine the interrelation of urban and nonurban areas.

In any region as diversified as the Potomac River Basin, many alternative uses compete for land and must be considered in programing land development. These include agriculture, industry, commerce, transportation, recreation, and private residences as well as land for public installations. Each must be examined thoroughly in order to provide an intelligent basis for effective, enlightened land-use planning.

AGRICULTURAL SHIFTS

American agriculture has experienced drastic change in the past 50 years particularly in mechanization. The result has been a large reduction in the amount of labor, generally assumed to be the scarce resource, needed to carry out the farming operation.

In addition to the impact on labor requirements, mechanization has influenced land-use patterns as well. Mechanized farming is best adapted to large expanses of relatively level, well-drained soil. This has meant enlarging and combining fields and, in many cases, even farms. Many small farms have been absorbed by larger operations because of the inability of small operators to efficiently utilize modern equipment.

Mechanization is not the only area of advancement in agriculture. New and improved strains of crops and livestock have increased yields and improved quality of products. Increased use of fertilizers and disease and pest controls have aided in the struggle for greater production. The net result of these technological advances has been greatly increased output per acre as well as increased labor productivity.

What has been the effect of these changes on the farm population? In 1910, approximately 32 million people, or almost 35 percent of the total United States population, resided on farms.[8] By 1950 the farm population had fallen to 25 million or 16.6 percent of the total. The census estimate for 1957 was 20 million or only 12 percent. Thus, a declining farm population is producing an increasing amount of agricultural products needed to sustain our growing national population.

Agriculture is experiencing another transition which may be attributed, at least in part, to mechanization and technological innovation. An increasing number of farmers are holding jobs in addition to their own farming operations.

[8] U. S. Department of Commerce, Bureau of the Census, and U. S. Department of Agriculture, Bureau of Agricultural Economics, Farm Population, Series Census–BAE, No. 16, March 9, 1953, p. 3.

For example, in 1944 approximately 30 percent of all Maryland farmers reported off-farm work. Twenty-five percent worked 100 days or more off the farm. In 1954, in spite of a decline in total number of farmers, over 47 percent worked some time off the farm and 34 percent 100 days or more.[7] The trend has continued and indications are that the proportion of farmers working off the farm will grow.

The impact of these trends on farming is sizable. There has been a pronounced shift from field crops to livestock enterprises. Dairying, long important in this area, is growing in importance because of the rapid growth in population and demand for milk. These dairy farms are generally large operations carried out by full-time farmers. There has also been an increase in other livestock operations requiring limited labor and which in many instances amount to little more than collection of family pets. As a result of this increase in "country living" or "gentleman farming," a sizable portion of good farm land has, for all practical purposes, been taken out of production.

In present times of agricultural surpluses, this may be considered admirable. This is true only if, in times of shortage, the land can be returned to agricultural purposes. However, this is not necessarily the case. Areas in which the "estate" type of farming predominates present attractive settings for residential development, and it is not uncommon to see these areas broken up by numerous developments, to be followed later by improved highways and further development. Once this has occurred, these areas, quite often highly productive farm land, are no longer suited to agriculture.

There is a definite need for farsighted, imaginative thinking regarding the future demands upon agricultural resources. The day may come when farm land, and not farm labor, will be regarded as the scarce resource. The role of regional planning is clearly evident. The responsibility of insuring against disorderly and indiscriminate encroachment is paramount.

Conservation of natural resources

Forest resources.—About 50 percent of the basin is in forests. However, because of forest fires and previous cutting, little commercial timber remains.[8] About 46 percent of forest land is in farms, 35 percent owned by private nonfarm interests, and the remaining 19 percent by Federal, State, and local government.[9]

Because of poor forest management practices and encroachment by farms, residences, and highways, basin forest land is only about one-third as effective as it should be in preventing soil erosion, river and stream pollution, floods, and in maintaining the water-holding capacity of the soil. Without adequate protective cover, soil washes away to the streams and rivers, increasing pollution problems and hindering filtering operations. Silt washes down the river and covers oyster beds, destroying a source of livelihood vital to the economy of the lower Potomac area. Maintenance of the river channel for navigation requires costly dredging as a result of heavy silt deposits.

Reforestation and other improved forest management practices can go a long way toward solving some of the numerous river problems. Much land currently in crops or pasture should be in timber, and a large share of present forest land could be greatly improved. This statement from the report of the President's Water Resources Policy Commission aptly describes the situation: "The basin deserves and can support something better than shriveled and scrubby timber stands." [10]

Farm land resources.—Much of what has been said about forest management can be applied to farmland management as well. It is estimated that 300,000 acres now in pasture and crops should be reforested.[11] In addition, proper farm management and conservation practices, such as terracing and contour farming, can help greatly to slow water runoff and prevent soil erosion; moreover, use of these practices generally results in increased net income to the farmer.

The United States Soil Conservation Service has done much to stimulate interest in soil conservation, and considerable progress has been made in impressing upon farmers and others the need for conservation measures. However, the need for more work is obvious.

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[7] U. S. Department of Commerce, Bureau of the Census, 1950 Census of Agriculture, vol. 1, pt. 14, p. 148, and 1954 Census of Agriculture, vol. 1, pt. 14, p. 1170.
[8] Ten Rivers in America's Future, op. cit., p. 579.
[9] Ibid., p. 592.
[10] Ibid., p. 584.
[11] Ibid.

Coal deposits.—One of the most important resources of the region has been the coal deposits of the western portion of the basin area. Coal mining has been a dominant force in the economy of this mountain area and has stimulated industrial development in many basin communities. Depletion of many of these coal deposits and the subsequent abandonment of a large number of mines has had a serious impact on the economy of this area. Unemployment problems have forced emigration from the mining region and have resulted in what has been called a "depressed area" in the midst of a strong and expanding national economy.

The indirect influence of this mining area on the basin in general and the river in particular is quite pronounced. The western areas have received much of the blame for river pollution. Unfortunately, these accusations often have been justified. Acids seeping from the mines, both operating and abandoned, drain into streams and contribute to the pollution problem. In addition, industry, attracted to the area by the availability of coal, deposits waste materials into the streams and intensifies the problem.

Wildlife resources.—In a region endowed with such an abundance of forests and streams, fish and wildlife would be expected to exist in profusion. Unfortunately, this cannot be said of the Potomac River Basin. Those fish and fowl which have survived have done so not because of conditions of the river and forests, but rather in spite of these conditions. This becomes a serious economic consideration in the southern reaches of the Potomac where fishing and oystering help help provide the livelihood for many communities.

Excessive siltation provides a definite danger to oyster beds and could easily destroy this marine life in the Potomac. Farther up the river, pollution is a danger to fish life and some breeds such as trout and small-mouth bass, once abundant, are no longer to be found.

Pollution is not the sole cause of the decline in wildlife. In some cases the river has been overfished and fish have been removed at a greater rate than they have reproduced or have been replaced. In the lower Potomac area, other forms of wildlife are suffering also. Much of the marshland habitat of migratory birds and fur-bearing animals is being reclaimed for farmland or for mosquito-control purposes. If this trend continues, many species common to the Potomac River Basin may soon be extinct.

This is a sad commentary on the presumedly abundant natural resources of the Potomac Basin. What it means is that resources once available have been very seriously depleted. Some of these can be replenished; others are irreplaceable. Concerted effort is required to develop and enforce programs directed toward salvaging and restoring the basin's natural resources. This should be the concern of not only nature enthusiasts but of all citizens of the basin, since all have a personal interest in this resource depletion. Water supply, flood control, commercial fishing, lumber supply, farming, pollution control, and water purification, as well as all types of recreation are involved. Conservation measures are very inexpensive in terms of the benefits reaped and can be helpful in solving numerous problems of the river basin. The potentials of conservation must not be ignored in planning for development of the Potomac.

Industrial land use

Much interest has been displayed in industrial development of the Potomac River Basin. Almost every community has attempted to attract industry. In a few areas this industrial expansion is well planned and channeled to organized industrial districts; more often the development is haphazard and disorderly. This general problem of industrial location is discussed at length in another section. However, in the land-use survey, current indusrtial land-use patterns should be studied in order to plan for future location of industry compatible with other land-use and community objectives.

Urban land use

Another important field for investigation, and one toward which the major efforts of existing planning groups are being directed, is the area of urban land use. As was stressed earlier, no study purporting to encompass the entire Potomac River Basin can concentrate solely on the urban areas and problems. On the other hand, metropolitan centers provide indispensable services for the region's economy, and their importance can hardly be overstated. Washington, D. C., provides employment, markets, commercial and trading centers, and numerous services for much of the region's population and is generally thought of as the basin's metropolitan center. There are, however, other

metropolitan areas which are important to particular sections within the region. Pittsburgh, for example, wields a strong influence over the western stretches of the basin region, while Baltimore is a more important center for some of the eastern Maryland areas. In addition to bolstering the region's economy, the cities provide their share of the region's problems. There are problems of water supply, pollution, transportation bottlenecks, and a multitude of others directly attributable to the metropolitan centers.

On the question of land use, explosive urban expansion is of vital concern to the planners, and in many instances the plans of the planners have lagged far behind those of the real estate developers and speculators. Present planning efforts are largely directed toward forecasting current expansion trends and anticipating future service needs such as schools, sewerage and water systems, streets, and police and fire protection. Local planning groups have completed or are conducting much of the research necessary for land-use planning in their respective jurisdictions. However, when viewed from the overall regional standpoint there are many gaps. These gaps must be filled and the various efforts coordinated before intelligent analysis and imaginative, effective regional planning is possible. Only then can urban land development be placed in proper perspective within the broader regional complex.

Criteria for determining land use

Because of the aforementioned problem of placing a monetary value on all land for all uses, allocating land for alternative uses is exceedingly difficult. It is upon this problem of establishing allocation criteria that considerable emphasis must be placed. It is obvious that this will be no simple task to be solved by merely inserting figures into a pat formula. Moreover, this allocation procedure must not be limited solely to present economic conditions and values. The fate of highly productive agricultural land near urban areas is a good case in point.

Our present state of technology in agriculture requires relatively level expanses of cleared, high quality land. The supply of land meeting these specifications is understandably limited. This same land is well suited to residential development, highways, industrial plant location, and other uses. Traditionally, this land has gone to the highest bidder, in keeping with our free enterprise system, and agriculture has been unable to compete. Many people would contend that this is a just and fair means of allocation which will lead to optimum distribution. This might have merit if current economic conditions were to remain the same, as is so often assumed. However, we may reasonably expect the production requirements placed upon existing farmland by a growing population to increase substantially. The "free enterprise" argument still might hold if land could be bid back by agriculture at some future date. This obviously will be impossible or at least extremely costly.

This situation is not limited to agriculture alone. The problem of preserving suitable land for recreational purposes is another excellent example. In fact no area of land use is immune to this pressing problem. The repercussions may be just as great to industry in the future as they now appear to be to agriculture and recreation. Consequently, present planners must have the foresight and imagination to preserve for future generations that which cannot be replaced.

A primary objective of any comprehensive study of land use in the Potomac River Basin must be the establishment of criteria for evaluating and allocating land for alternative uses. Until this objective has been achieved, the task of land-use planning can be only partially effective.

WATER REQUIREMENTS AND WASTE DISPOSAL

Two closely related factors in the future of the Potomac Valley are those of water use and disposal. This set of problems is in turn basic to all other development factors for the region.

Residential demand for water

The water requirements problem has generally been considered in terms of two factors: Number of persons and water requirements per person. This simple approach must be supplemented. A reasonable beginning position is consideration of the number of persons assumed to be residents of the area and the role of population growth. Population estimates must not be based upon projections of current conditions, but must consider particular goals in community development.

It must then be emphasized that no single per capita water requirement factor can be applied to population figures; urban residents have a water-use pattern which differs from that of the suburban or the rural resident. Age groups, income level, and technological development are additional factors. The technology factor is particularly important in affecting the trends in the other variables. Industrial needs form a separate major problem which will be considered below.

Until more evidence is available, it cannot be assured that the demand for water is unrelated to the price at which it is made available. Therefore, the water-supply factors must be analyzed in detail.

Industrial demand for water

Water is rapidly becoming a scarce resource in the United States economy. Always at a premium in some areas, it is now a primary factor in the location pattern of industry.

In Maryland in 1953, total water intake by manufacturing plants alone was 242 billion gallons. As shown in the accompanying table, the largest total user was the primary metals industry (mostly steel), requiring 123 billion gallons. However, the most water-intensive industry was petroleum and allied products, requiring 19.5 million gallons per employee.

The growing scarcity of industrial water is underlined in the table by the indications of increased reliance upon brackish (salt) water, despite its corrosive qualities and the high percentage of recirculation, reaching 100 percent for petroleum and metals. No more graphic commentary is provided upon the facts of dwindling water supplies and expanding sewage problems than the recent decision of the Bethlehem Steel Co. to use sewage effluent from the city for industrial purposes at its Sparrows Point plant.

Many industries are completely dependent upon large supplies of water for cooling, power, or processing, and sites of adequate water supply are dwindling fast. It is thus not surprising to find the Potomac and its tributaries under continual pressure for industrial development. In view of this pressure, it is relevant to examine the record of historical experience in the industrial use of the Potomac.

This record has not been good. The condition of the river at Luke, Md., carrying the waste of acid discharge from mines, raw sewage from local communities, and industrial waste has long been the shame of Maryland. Local communities have been just as serious offenders in many cases as industrial concerns, some of which have begun recently to manifest concern over their depredations. Until a cooperative movement is made to rehabilitate the entire valley, no one firm or community has much incentive to undertake expensive purification facilities.

This problem does not confine itself to local, county, or even State jurisdictions. The Opequon Creek is defiled with sewage and industrial waste in Winchester, Va., flows through West Virginia, where it is further polluted with sewage from Martinsburg, and then flows into the Potomac below Williamsport, where Maryland receives the full bounty of this interstate commerce. The lovely Shenandoah River is now under threat of similar exploitation. Likewise the Conococheague Creek carries sewage from Chambersburg and Greencastle in Pennsylvania, and the Antietam Creek of Civil War fame carries sewage from Waynesboro, Pa., through Maryland into the Potomac.

Industrial water use in Maryland and the United States (1953)

Establishments reporting 20,000,000 or more gallons of water	Total water intake		Percent of total fresh water intake by source			Brackish intake as percent of total	Water intake by establishments recirculating water as percent of total intake
	Billion gallons	Million gallons per employee	Public water systems	Company water systems			
				Surface water	Ground water		
United States, total all industries	11,430	1.50	19.8	66.7	13.5	21.3	52.6
Maryland, total [1]	242	1.74	18.4	40.8	40.8	69.9	92.8
Chemicals and allied products	37	3.26	16.3	73.7	10.0	49.4	72.3
Petroleum and allied products	49	19.50	21.2	----	78.8	94.4	100.0
Primary metal industries	123	4.04	5.1	----	94.9	80.6	100.0
Electrical machinery	1	.07	43.7	----	56.3	----	77.2
Transportation equipment	2	.05	97.8	----	2.2	23.4	6.1

[1] The list of individual industries is incomplete. Consumption of this group totals only 212,000,000,000 the 242,000,000,000 gallons consumed. Census disclosure regulations prohibit publication of the figure when less than 3 firms are involved.

Source: U. S. Department of Commerce, Bureau of the Census, Water Use in Manufacturing 1953 Annual Survey of Manufacturers, series MAS-53-3, Jan. 27, 1953, pp. 3, 8.

It should by now be recognized that any user of water, community or industrial, has an obligation to return to is source as much as possible of that water in pure condition. To fail to do so is to extract an expensive subsidy from downstream communities and from the region in general.

Industrial use of waterfront also results in other large costs which the community rather than the individual business must bear. One plant, with its noise, fumes or smoke, or heavy traffic, may purchase a hundred-acre site, but make a thousand acres impossible of use for homesites or recreation. In its desire to reduce costs, the plant is often built directly adjacent to the water, without recognition that water intake and overflow lines might be utilized to permit use of a location distant from the river, permitting alternative use for other purposes.

Much more research is necessary to indicate the effect of industry in terms of advantages and disadvantages to individual communities. Those areas in which residents are convinced of the benefits should consider the advantages of providing planned industrial districts which guarantee the essential services and zoning required by industry, while at the same time protecting the community by channeling development into specific areas which will not result in uncontrolled exploitation of civic, residential, and recreational values.

How much of the annual water flow of the Potomac can be considered available for industrial purposes? Clearly this depends upon many factors, including future population requirements for water and the extent to which the river can be cleaned up. Currently Washington residents consume approximately 150 gallons of water per person per day. Industry required per worker in 1953 [12] an average of 4,110 gallons per day for the United States and 4,767 for Maryland.

In terms of water use at these rates, the water consumption of every industrial worker equals that required by 27 urban residents at United States rates of industrial water consumption, and 31 residents at the slightly higher Maryland rate of water use. Since suburban rates of water consumption appear to be approximately one-half those of the District of Columbia, 60 or more suburban residents can be supplied by the water required for each industrial worker.

[12] U. S. Department of Commerce, Bureau of the Census, Water Use in Manufacturing, 1953, 1953 Annual Survey of Manufactures, Washington, January 27, 1955.

If population growth is to be nearly as great as the projectors assume, then clearly the water available for industrial use will be sharply limited. Unless industrial users return pure water to the river, their total usage of water must be recognized to include not only that consumed but, additionally, whatever downstream flow is contaminated by the discharge. Industrial use must be considered a residual. Additionally, local city water supplies and farm irrigation have prior legal claim to the water. Until it is conclusively demonstrated that population in the region will be held down to a level which will permit a sizable residual of industrial water, it seems most unwise to permit industrial location along the Potomac or its tributaries. Even if impoundment of the river behind a high dam at River Bend would equalize the seasonal flow sufficiently to provide water for industry as well as the growing population, it is not at all clear that this development would be worth its cost over the long run. The dam is no doubt feasible from an engineering viewpoint, but this is a minor technical consideration in view of the broad general goals of community development.

The supply of water

While the Potomac River must be considered the major source of supply in the region, certain tributaries and auxiliary sources should not be excluded from the analysis. Many rural households and some communities will continue to depend upon wells drawing from ground water supplies. The Patuxent River in Maryland and Occoquan Creek in Virginia also provide a large volume of water; however, they are relatively minor in comparison with the Potomac.

One of the striking factors about the Potomac is the variation in its flow, seasonally and annually. This irregularity has constituted one of the arguments for construction of a huge dam at River Bend which, it is claimed, is necessary to impound the heavy spring runoff for consumption during the dry summer period of maximum use. In addition to providing an even flow of water for a projected population, other services claimed for the high dam are sewage flushing in the Potomac, irrigation, flood control, hydroelectric power, and recreational facilities. It has also been claimed that siltation rather than sewage is the main contaminant of the river, and that the high dam is necessary for settlement purposes. Prof. Abel Wolman of Johns Hopkins University has stated that this is a prerequisite to his clear-water lake for Washington. The Wolman plan has other aspects which are discussed below. This array lends the prestige of the term "multipurpose" to the proposal.

There are, however, a number of questions which the boosters of the high dam answer inadequately or not at all, and which should be evaluated in relation to the entire Potomac River Basin area. The contamination problem is major and requires urgent attention in both its sewage and silt aspects. It should be clear by now that no amount of flushing will provide a safe or satisfactory answer to the contamination problem. The proposal to use a charge of water to move the waste farther down the river at a faster rate provides an excellent example of the limited viewpoint which would attempt to alleviate problems in one part of the basin by floating them downstream to plague other communities. The only satisfactory answer to the sewage problem is to construct treatment plants which will prevent the untreated sewage from entering the river. Until this is achieved, construction of the proposed high dam can only result in the creation of a contaminated 36,000-acre lake.

There is no safe, hygienic method of dealing with sewage once it is in the river, and any method or proposal which attempt to compromise with the provision of adequate treatment plants can only be a stopgap.

It is time to recognize that the generation of waste is an inevitable result of real-estate development, and that the disposal of waste is a social obligation which must be paid for ultimately. To the extent that taxes and "front foot benefit" charges fail to cover the total costs of adequate disposal plants, the builder and the new resident have received a subsidy from the rest of the community. In thus overloading existing sewage facilities, the price of new housing fails to reflect all of the costs involved, and aggravates a situation which will eventually have to be corrected by the entire community at great cost. The result of this hidden sudsidy is artificially lowered housing prices, which causes overdevelopment of new areas.

With the increase in population, movement of rural populations to the city, and disappearance of open land, the growing pressure upon recreational facilities is forcing an awareness that the Potomac is a single river which cannot be contaminated at Rock Creek or Blue Plains without painful consequences at the Jefferson Memorial and Mount Vernon. An enlighted public awareness is finally

generating a pressure which demands the removal of filth from the Potomac. Washingtonians and the Nation are no longer willing to tolerate an open sewer flowing through the Nation's Capital.

Obviously this will be an expensive situation to correct. It is questionable whether purification plants of sufficient size and efficiency can ever be constructed on the scale necessary to result in a clean Potomac. The river is simply too limited in its size and flow. This means that contamination must flow for many miles, despoiling long stretches of landscape which should be recreational areas. The situation had grown so desperate that the planners of the proposed Levittown for the Belair estate are reported looking to the Patuxent River, already overloaded by Laurel, Fort Meade, and National Security Agency discharge, for sewage disposal. Would this provide the entering wedge for further disposal into the Patuxent from housing in the proposed "fantastic triangle" of development now anticipated between Washington, Baltimore, and Annapolis? It has already been announced that the Potomac Electric Power Co. has acquired land for industrial development farther down the Patuxent in the southern tip of Prince Georges County. Action must come quickly if these rivers are to be saved from the status of sewage outlets for private interests.

These developments have come so quickly and so cumulatively that few persons realize the jeopardy in which the Patuxent watershed now stands. Fortunately the Maryland State health department has recently affirmed its determination to enforce existing laws against contamination. Undoubtedly a proper concern over these gathering pressures influenced their statement. However, a vigorous and enlightened public support of the health department will be necessary if the public interest is to be protected against the enormous pressure of private profit opportunities.

Against the background of the limited capacity of the Potomac and the Patuxent—these long, narrow rivers, whose contamination creates such extreme lengths of defiled waterfront—some imaginative thought on the disposal problem is more than ever necessary. It is for this reason that the recent proposal by Wolman and associates for delivery of waste to adequate treatment facilities on the Chesapeake Bay merits attention.

The Wolman plan has three major aspects, each of which merits detailed study:

1. Rehabilitation of the Potomac River, and piping of waste from the entire metropolitan area to the Chesapeake Bay for treatment and disposal.
2. Creation of a waterfront basin for Washington utilizing the Potomac River after purification.
3. Construction of a high dam at River Bend.

The bay, which has imposed its tidewater imprint upon the entire region, is probably the most important and significant single resource in the larger area of which the Potomac forms a part. It is difficult for anyone acquainted with this majestic and unique inland sea to contemplate the threat of contamination. To permit impairment of the fishing, swimming, boating, and residential use of the bay is unthinkable.

The Wolman proposals contemplate treatment plants to reduce the load of contamination to levels which would presumably affect only limited areas of the bay, with its great recuperative powers, and contribute to, rather than detract from the support of marine life. Perhaps this is preferable to discharging the same quantity of waste into the Potomac and Patuxent Rivers, whose carrying capacity is much less, but which affect a much larger area.

However, just as war has been described as too important to be left entirely to the generals, so the cleanliness of the bay is too important to be left entirely to sanitary engineers. Any plans for piping of waste from Washington, D. C. into the bay should be subjected to the thorough scrutiny of naturalists, seafood specialists, public health officials, marine biologists, and bacteriologists.

Other parts of the Wolman plan also deserve careful attention. The proposal for a pure water basin development for Washington represents creative imagination. Visitors to European capitals, particularly in Scandinavia, are impressed by the contrasts between the present condition of the Potomac and the dramatic developments of other waterfront capitals. The cleanliness of the water is a matter of national pride, and the waterfront is developed as a showplace and integral part of the city.

However, it has not been demonstrated that the high dam at River Bend is essential to development of a clean waterfront area in the District of Columbia. The tidal rise and fall in Washington is not great except under rare circumstances. The problem of silting should be corrected at the source through

cover crops, contour plowing, reforestation, upstream dams, control of construction activity, and other soil conservation measures. Otherwise the high dam will eventually become a high mudbank with a host of serious problems. Wolman's proposal for a high dam fails to consider alternatives, some of which are listed below.

The proposition that a high dam, through creation of a 36,000-acre lake, would provide unique recreational opportunities has not called forth the expected response from organizations interested in this aspect. They point to the loss of 35 miles of the unique C. and O. Canal with its towpath, inundation of vast wilderness areas now readily accessible to the Nation's Capital, exposure of mudbanks during the summer drawdown period, and in general see the recreation issue as a specious argument in support of an unwise proposal.

The flood-control argument is also cited in support of the dam. No one approves of floods, controlled or otherwise. However, a series of upstream dams on tributaries is an alternative whose study should be supported by all who have witnessed the fury of a downstream flood. It is argued by the electrical cooperatives that a high dam would provide hydroelectricity, perhaps to a maximum of 10,000 families, at low cost. This argument hinges upon the assumption of Federal subsidies. Even if a high dam were built, the Potomac Electric Power Co. would use its water for cooling purposes only, since the total amount of hydro power which could be produced is small, and its cost consequently high. A River Bend Dam is difficult to justify, even by devoted public-power proponents.

In summary, none of the individual arguments for the River Bend Dam seems to hold water. Nor can much of a "multipurpose" justification be made for the project if the individual purposes are illusory. All of the individual pressures which were concentrated in support of the Corps of Engineers' request for added funds for a priority study of the River Bend project suggest an unseemly haste and a prejudgment in this project, which cannot be studied in isolation from the rest of the valley. Nor should the Corps of Engineers be relied upon for an effectively study of the problem. Preoccupation with physical construction should not be permitted to distract attention from the real problem of overall objectives in the long-term development of the entire District of Columbia Potomac River Valley.

Why is so much pressure being exerted to construct a high dam at River Bend so quickly? There are many alternatives which should be considered with respect to a multipurpose, long-run solution of the regional problems in the District of Columbia-Potomac area. Where is the evidence that the Corps of Engineers has considered these alternatives, their relative costs, and benefits? Surely the public should be advised of the availability of alternative approaches and invited to participate in their evaluation.

Once a dam is built, the act is irrevocable. However, before the public bows to pressure for an exclusively engineering solution, there is time to consider more comprehensive proposals.

Some of these alternatives, which include the Wolman plan, complete treatment of all flows before entry into the Potomac, and methods, using recent technological advances, are suggested in the comprehensive research outline at the end of this study.

INDUSTRIAL DEVELOPMENT AND LOCATION

Background and assumptions

Too often we are misled by concealed assumptions, and the answers to problems are predetermined by the form in which the questions are posed. This is particularly evident in the debate over industrial development. In recent years many communities have engaged in competitive efforts of a rather shortsighted nature to induce industry to build plants in their particular areas. Most of these sales efforts have behind them a development program based upon the question: How much of what kinds of industry can our community attract?

The question posed in this form tends to generate an effort at maximum industrial development. The logically prior question—Should an effort be made to attract industry into the community?—has been ignored. The uncritical assumption is widely accepted that change is progress and that industrial development is a form of community blessing particularly to be sought.

This booster approach, which might be called the Dodsworth or 1920 view, is considerably easier to understand than to justify in terms of long-run benefit to the community. Areas which have lost industries or are dependent upon single,

fluctuating, or declining industries, may have urgent need for replacement in order to alleviate unemployment and economic distress.[13] Communities whose requirements for community services are growing faster than tax revenues may feel the need for some immediate action. The District of Columbia metropolitan and Potomac River region does not need and cannot afford to be so uninformed and uncritical in its approach to development. Incomes are relatively high and stable, and community needs, though never completely satisfied, are being met. There is time to take a comprehensive look at the problem, which is so significant in terms of the future of this region: What is the proper role of business and industry in community development?

The role of business and industry

Given the importance of United States manufacturing industry to the Nation and the world, it is still essential to analyze its proper role in specific communities. To do so in the case of the District of Columbia-Potomac region would require and justify a large-scale research project. However, it is possible to indicate at this time a few essentials which would have to be included in a comprehensive project, and some of the questions which require answers.

As suggested above, it is a serious disservice to the community to place the industrial question at the center of the stage, adapting the community plans to the requirements of industry. No one seems to have started with the obvious priority question: What is the optimum type of community into which the District of Columbia-Potomac region should develop? Once this question is posed, a number of fallacies are exposed.

Fallacy No. 1: Population projections.—The basic nature of population as an economic variable has led to unfortunate applications. One obvious error is the mechanical projection of current or recent growth rates. Although much effort is consumed in arguing proper methods of population estimation for an area, it is certain that mere passage of time, and performance by the Census Bureau, will give the correct answers. Of greater concern is the assumption that population growth is an inexorable phenomenon to which everything else must be adjusted. The fallacy should be obvious. Population growth is actually interrelated with the other aspects of society and should be recognized as amenable to adjustment. Local pride, business hopes, and fascination with the mechanics of forecasting often lead to efforts to build for a projected population rather than to discover the size of population which can be comfortably accommodated in a region. Thus projections of regional development may actually lead to efforts to create the results predicted. Growth occurs because growth is predicted because growth has occurred. The central problem of a desirable target and rate of growth toward it is overlooked.

Fallacy No. 2: Projection of physical growth.—Planners tend to project mechanically into the future not only population growth but also the physical growth of automobile registration, highway construction, and number of residential units required. Some of the implications are discussed under the heading of "Transportation." Community efforts to provide the physical facilities whose need is predicted may only add to a rate of growth which is excessive.

Fallacy No. 3: Assumption that the establishment of industry or business automatically benefits a region.—It is often assumed that economic progress can only be achieved through the medium of wages and taxes paid out by new firms which are induced to settle in an area. Too often it has been overlooked that new industries also bring with them substantial costs, in terms both of demands for utilities and services by the new firm and similar facilities for the new workers who will man the plant. These community costs may well exceed the value of benefits conferred. Financial failure by bargain-hunting firms attracted into an area by unwise tax concessions has created economic hardship. Recent studies by Isard and Coughlin have confirmed that only under special circumstances, related among other things to wages paid and services required, can new industry confer net advantages upon the community.[14]

Fallacy No. 4: Assumption that economic progress can only occur through business or industrial development.—Such is our preoccupation with the symbols of growth that we often assume not only that industry automatically confers

[13] University of Maryland, bureau of business and economic research, Coal in the Maryland Economy, Studies in Business and Economics, vol. VII, No. 3, December 1953.

[14] Walter Isard and Robert Coughlin, Municipal Costs and Revenues Resulting From Community Growth, Federal Reserve Bank of Boston and American Institute of Planners, Cambridge, Mass., n. d.

benefits, but also that manufacturing industry is the only source to which we can look for higher personal incomes and a larger regional tax base.

The study of international economic development has suggested that often a favorable alternative to manufacturing is the improvement of agriculture or development of other local resources. Surely the District of Columbia-Potomac region has unique cultural, service, and governmental assets and resources which should be thoroughly analyzed as alternatives to industrialization. In raising the question of the type of region toward which the Capital area should evolve, a possibility which should not be excluded is that of a low-population, low-density, nonindustrialized cultural community. It is even conceivable that the real problem is not one of insuring growth but of reducing or retarding the rate of growth and channeling it into preferred directions.

The community has excellent and effective controls for channeling growth into desirable patterns. These methods are planning and zoning procedures, along with control of building and extension of water and sewer lines, which actually determine where development is to take place. Unfortunately, these functions have too often fallen into the control of the very groups who are able to use community planning for their own private profit rather than for the long-run public interest.

Although its relevance to the merits of the case may be debated, a study of the question, Who gains and who loses? goes far in explaining much of the debate over economic development, as well as the line-up of opponents and proponents. Although a complete list cannot be attempted at this point, it is clear who gains from industrial and real estate development. A partial list includes landowners, construction companies, roadbuilders, real estate operators, lawyers, speculators, retailers, particularly supermarkets, shopping centers, financial institutions, and public utilities.

The list of those who lose from development is less indentifiable and less politically cohesive, but many include many who are unaware of their own interests. It includes small-business men, long-time residents, small farmers, out-of-doors enthusiasts, local commuters, and city planners.

The gains from rapid growth, being financial, are tangible and immediately recognized. The losses may be such intangible factors as the social losses from community deterioration, disappearance of parks, recreational areas, and open spaces, and other assaults upon the human spirit which cannot be measured financially. The almost universally accepted zoning principal recognizes the fact that the free-market maximum-profit system in real estate does not operate in the public interest. Precisely because the operation of open market in real estate often results in poor allocation of land and resources, community planning is essential. But the process of planning requires creative imagination and constant safeguarding against control by profit seekers.

It is not surprising that the more numerous and powerful members of the "developers" frequently dominate the planning and zoning boards, utilities commissions, and regulatory boards, county commissions, and other power-wielding groups.

TRANSPORTATION

The setting

In considering planning for transportation, the following premises are offered as of basic importance:

1. Since the conveyance of persons and commodities is involved with respect to space, time, specific route, convenience, comfort, safety, efficiency, costs, and charges (fares), a transportation program is related to all other factors, both human and physical, and cannot be developed in isolation. It must yield priority to overall considerations of land use and human welfare programs, and must merge into an integrated regional plan.

2. As a corollary, responsibility for planning the routes, facilities, structures, characteristics, and services of transportation must be assigned to a group representing a variety of professional competence. Not only is the engineer, but even more significantly in the nonmechanical aspects of the program are the naturalist, economist, land-use analyst, urban planner, and statistician essential.

3. So much of the background material upon which a program is built consists of estimates, or guesses, ranging from future population growth and its concentration, individual and family incomes, development of industry and commerce, to an assumed place of automobiles in the future family budget, that choice of methods of analysis and projection formulas tend to predetermine the plans. Frequently the mathematical formula is superior to the data; sometimes the

formula is worthless. Most transit surveys, including interviews and questionnaires, are unscientific. Usually contemporary conditions are accepted as patterns to be projected into the future. Consequently, it is essential that top-rank specialists in statistical methods and analytical procedures be associated with programing and planning from preliminary to final stages.

Danger signals for plan evaluation

The "consumer" of transportation and the nontechnical citizen can follow programs, plans, and developments and participate in their evaluation by careful observation of maps, visual projections, specifications, and official statements. A healthy skepticism is an important attribute in this observation. Sometimes statements of plans are couched in persuasive, promotional language. Perhaps the most difficult situation occurs when officials do not provide adequate information, or when reports, for instance, of public hearings, are "slanted" in favor of the official attitude.

Illustrative of the nature of ideas and procedures which should be examined are the following groups:

Concepts.—Mobility and speed have become fetishes in the attitudes of many persons. If it were assumed, because the present rate of increase in automobiles is greater than the present rate of increase of human population, that one of these days every American will have at least one automobile, it is readily seen where such "logic" would lead. It would seem to follow that we could dispense with bus and streetcar and other commuting facilities and concentrate upon highways, speedways, and throughways. Fantastic? Speakers at the 1955 conference of the American Society of Planning Officials tended to accept the two-car family as certain; but one prognosticator's forecast was "a movement away from the 'family car' and toward the private, personal vehicle." [15] If, on the average, there are 3.6 persons per family, presumably there would be 3.6 vehicles per family. What would the children drive? What part of the family budget could be shifted to this acquisition?

Each individual has special interests, and too frequently the interests associated with business, professional or other work or income activity are so predominant as to obliterate the consumer interests of the same person, to his detriment. This is true when the road contractor or highway engineer, in his capacity as an official, but with business and professional attitudes dominant, approves destruction of parks to provide highways. In evaluating plans, it is important to observe the special interests of members of government or advisory units and, when possible, to offset these interests, with diverse atitudes.

Discussing the subject "Is This Trip Necessary?" an engineer of the United States Bureau of Public Roads remarked [16] that the highway engineer has never "felt that it lay within the scope of his duties to act as arbiter of this question. His job has been to build highways. * * *" This is a commendably frank statement, but as reported subsequently, the same engineer, in the same speech, seemed to forget this commitment, and expatiated upon an expectation of voluminous future trips necessitating a tremendous roadbuilding program.

Limitations upon use of present patterns of traffic development for forecasting are obvious when causal factors are examined. For instance: "In most cities, low income and high density go hand in hand, density decreasing and income increasing with distance from the central business district. Car ownership reflects these economic considerations, with highest ownership in the suburban fringes. Of late, there is increasing evidence of automobile ownership saturation in the fringes. If car ownership continues to increase, it can only mean that the saturation point is moving closer to the low-income, high-density city center." [17]

Additional suppositions relate to suburban dwellers. It is often assumed that those who move to areas outside the city still must depend upon the central city merchants and services, including recreation, as previously, even though the employment location has changed and local shopping and recreational centers have developed. The term "satellite community" is exciting and has led to many mechanical diagrams locating obsequious towns paying tribute to the master city. "The central area will always be the main focus of traffic" [18] is a statement

[15] Richard L. Meier, Planning for Tomorrow's World, Planning, 1955, American Society of Planning Officials, Chicago, 1956, p. 17.
[16] Gordon B. Sharpe, Is This Trip Necessary– Planning, 1955, p. 145.
[17] F. Houston Wynn, Is This Trip Necessary? Planning, 1955, p. 142.
[18] National Capital Park and Planning Commission, Washington, Present and Future, Washington, 1950, p. 27.

requiring analysis. In the Washington area, with dispersal of Government agencies in process and presumably to be accelerated, residential areas and shopping, service, and recreational facilities, with some exceptions, will tend to follow. Emphasis upon radial streets to carry traffic to and from the city would appear an attempted offset to the dispersal plan, a device perhaps to encourage patronage of the central city area. However, circumferential routes "* * * will be emphasized as Federal employment centers are decentralized."[19] It would appear advisable to concentrate upon a counterplan with emphasis upon dispersal and migration. This should be accompanied by an effective zoning pattern protecting the Nation's Capital from congestion, from noise and fumes, and from the encroachment of parking lots upon parks, monuments, and historical places. Vital to this plan would be an efficient and pleasant public transit system.

In contrast to the proponents of more traffic and bigger and more numerous highways, F. Stuart Chapin, department of city and regional planning, the University of North Carolina, comments: "To put it more baldly, is the design of our expressway systems too closely dictated by present-day commuting pattern? * * * Indeed, thoroughfare planning predicated on existing land use patterns and simple projections of present commuting patterns may have the effect of forcing an imbalance. * * * The key importance of the land development plan would seem to be elemental and require no particular laboring, yet how many of the multimillion dollar expressway systems being carved into our metropolitan areas are related to a farseeing, carefully conceived metropolitanwide land-developmental plan? Are these fabulously expensive urban highways with their interchanges * * * simply begetting more highways * * *?"[20]

Highway encroachment.—The highway-construction enthusiast is likely to concentrate exclusively upon transit and roadbuilding programs, neglecting other essential demands upon the use of the land proposed as a right-of-way. This type of partial, segmental approach to planning frequently creates more problems than it solves.

Because of the dynamic and controversial nature of transportation planning in the area adjacent to Washington, D. C., most examples of problems are chosen from this locale. But the implications are common to all areas. Among observations applicable to public parks and directly related to the Potomac River Basin are the following:

(*a*) Historically, land set aside for public recreation or as a natural sanctuary usually is regarded at the time as of no utility for other purposes. Geological formations may be rugged; or the land is subject to inundation; or the soil is waste and nonproductive. Few areas in the East have been planned with the recreational needs of future generations as a sole objective.

(*b*) As the human population grows and the pressure for community expansion, residential dispersion, and transportation improvements increases, these areas of recreation and sanctuary tend to be brought under reconsideration for new uses. Their original purposes are then regarded as of minor significance, and encroachments disregard the basic human needs initially protected.

(*c*) The new proposals usually are short-range efforts to ameliorate immediate pressures or to meet current problems with little reference to future needs. Too frequently they are dominated by political or commercial considerations. They are shortsighted, single-purpose encroachments rather than long-view, multipurpose plans.

For years citizens desiring to preserve the historic Chesapeake & Ohio Canal and adjacent park land along the Potomac River between Washington and Cumberland have found it necessary to protest against many proposals for its destruction or impairment. Competitive struggle for its defacement has continued among proponents of roads, dams, and industries. One persistent plan has been a parkway, which is not a park but a highway restricted to passenger vehicles, and with a center grassplot.

Arguments in protest may be summarized as follows:

(*a*) Construction of the winding parkway as now proposed along the canal would not meet the official proposal for a high-speed, high-density traffic artery in this area.

(*b*) Despite assurances to the contrary from the National Capital Planning Commission, construction of the parkway as now planned would in many places, notably from Chain Bridge to Brookmont, at Glen Echo, and at Carde-

[19] Ibid.
[20] Stuart Chapin, Is This Trip Necessary? Planning, 1955, pp. 150, 151.

rock, place the road close to the canal, completely despoiling these areas as recreational sites. In addition, construction according to these plans would be highly expensive, especially the proposed cantilever (double-deck) stretch at Glen Echo.

(*c*) Thus functional and economic justification for constructing the parkway is lacking. In addition, there is no legislative mandate that the road be built along the canal, which now provides irreplaceable recreational facilities and historical values.

(*d*) What is essential in the area is a centrally located highway capable of carrying local traffic. MacArthur Boulevard Extended (Conduit Road) is ideally located and suitable for this function.

(*e*) The Army engineers' position that (1) the old conduits underlying this road will not stand additional stress; and (2) these conduits now and continually require repairs, suggests that the conduits should now be reinforced specifically for the purpose of an adequate boulevard and efficient water transmission.

(*f*) A direct Washington-northwest route, avoiding the meandering contours and rugged topography of the Potomac River, should approximate the River Road location, or even a more northerly route.

Another example of proposed road encroachment upon parks is U. S. Route 240, also designated the Washington National Pike, which, in addition to the Rockville Pike, descends from the north resembling an octopus with tentacles reaching for the proposed outer circumferential highway, a southeast leg, the George Washington Memorial Parkway (the C. & O. Canal parkway), a proposed Cabin John Bridge, and the George Washington Memorial Parkway sector in Fairfax County, Va.

The Maryland-National Capital Park and Planning Commission in October suggested alternative plans for bringing route U. S. 240 into the District of Columbia. One approach would be by way of the River Road to Little Falls branch, where it might veer south to the Potomac River or continue east to the Wisconsin Avenue neighborhood and then directly south to the Potomac River through Glover and Archbold Parks.[21] These routes have been under consideration by the National Capital Planning Commission, which has recorded preference for the Glover-Archbold route, and by the District highway officials, who favor the Potomac River route. The District officials are reported to have based their preferences on the desire for space for eight traffic lanes. Again it is apparent that public parks are regarded by officials as expendable. In parks there are no private property owners to be dispossessed, with attendant opposition and compensation. Maps of 1951 proposed Wisconsin Avenue as the route in Montgomery County and in the District of Columbia; by 1956 the shift from Wisconsin appears in the plan maps.

Another public area in jeopardy is Washington's famous Rock Creek Park, a scenic narrow strip of valley, stream, meadow, and hill, of which Viscount Bryce, author and a former British Ambassador to the United States, wrote: "What city in the world is there where a man * * * can within a quarter of an hour and on his own feet get in a beautiful rocky glen such as you would find in the woods of Maine or Scotland * * *?" [22]

This beauty and its public enjoyment presumably have no place in a rush program of highway construction. Herbert W. Wells of the Maryland-National Capital Park and Planning Commission is quoted [23] as stating "eventually we will have to force a road down there." The word "force" is appropriate. An impetus to this depredation is approval by the Bureau of Public Roads of a Federal grant financing up to 90 percent of the cost. This assistance is available under the Federal Aid Highway Act of 1956.

Another type of encroachment is the effect of high-density traffic arteries upon the central city. Air pollution, smog, is becoming a crucial problem in every city. Private passenger automobiles, buses, and trucks discharging heavy exhaust are a major factor. Automobiles brought into the city require parking space. Parking lots are unsightly city concomitants. Pressures are continuous

[21] In 1924, two Washington residents, Charles Glover and Mrs. Anne Archibold presented to the District of Columbia tracts in a long, wooded valley, meadow, and hilltop, for preservation for the enjoyment of the residents and visitors from all parts of the Nation.
[22] Quoted in Washington: City in the Woods, Audubon Society of the District of Columbia, Washington, 1954, p. 7.
[23] Jeff O'Neill, Washington Post and Times Herald, October 31, 1957.

to make the surface areas of public land available for temporary storage. Though incredible, it has been proposed that the Federal Mall be converted to automobile parking to solve Washington's storage problem.

Still another infringement is the "trade" effected between city officials and private business concerns in some cities in which the firm relinquishes footage of its area for widening of streets in exchange for official approval of higher commercial or office buildings.

On October 19, 1957, a news item in the Washington Post and Times Herald announced that the District Commissioners' Citizens Zoning Advisory Committee had the previous day endorsed a set of zoning proposals which completely invalidated major provisions of the recommendation of the special consultant, Harold M. Lewis. Lewis recommended that future buildings in downtown Washington be required to provide some off-street parking facilities for vehicles; a majority of the committee membership opposed this requirement as well as part of a similar application of off-street parking facilities to apartment houses. Another inroad upon Washington's traditional limit to building heights was the approval by the committee of a higher maximum and an increase of the floor-area ratio. The purpose of the traditional and official limitations has been to emphasize Washington as the center of government rather than the center of commerce.

Research methods.—In a foregoing section, attention was focused upon concepts and upon the dangers attending unquestioning acceptance of premises which may completely vitiate objective evaluation of factors and thereby prevent a logical and practical plan. As these concepts are expanded into propositions, a structure is established which channels thinking automatically along prescribed directions. These channels become accepted as "logic" and a mathematical formula may be called upon as a machine to carry through the quantitative solution. The formula may be inappropriate; the assumptions may be false; the observations may be limited or special. Under any or all of these circumstances the result is erroneous and may be in conflict with public interest.

Many estimates are based upon survey and sampling techniques which are highly technical in all stages from planning to analysis. A very small number of professional mathematical statisticians are competent to guide procedures and to evaluate results. Yet traffic experts and highway engineers are employing in these fields techniques which they are not competent to use.

Averages derived from one population group or area should not be applied to others. Averages of rates are particularly untrustworthy; an average of traffic flows on routes A and B has no necessary significance for either A or B individually, and certainly not for route C.

The same engineer who modestly regards his job as roadbuilding has nevertheless dealt in the application and adaptation to transport of a so-called law of the gravitation type. He proposes "auto travel time" as a distance factor and "the retail area dedicated to apparel as the measure of the 'size of the shopping area.'"[24] The figures used were "reported trip data." This is a tenuous approach and the engineer has stepped into a very specialized and professional field from which he should hurriedly retreat.

Interviewing as a means of obtaining information on trips is notoriously difficult and the results specious. As a technique it has as many hazards and the results are as incommensurable as any research procedure. The validity of resulting data is questioned by most trained statisticians, particularly if they are also psychologists.

Among proposals for improving bases for analysis, Dr. Chapin suggests[25] the importance of future employment centers in relation to the generation of traffic, as well as magnets for new centers of residence and of shopping convenience. This consideration is not new in the thinking of some analysts, and is particularly important to the Potomac Basin in observing the shifting and dispersal of personnel as the plan is implemented for the transfer of Federal agencies from downtown Washington. Already the Bureau of the Census, the Atomic Energy Commission, the Bureau of Standards, the Central Intelligence Agency, the Geological Survey, the National Security Agency, and a number of military service units are among agencies which are dispersed or soon will be moved from Washington. Traffic will remain chaotic until official planning includes land use reservation for new homes and new commercial areas.

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[24] Sharpe, op. cit., p. 149.
[25] Chapin, op. cit., pp. 150–153.

Personnel.—Sufficient emphasis has been placed upon the need of professional competency to indicate that the engineer, however competent in road construction, is not professionally equipped in most of the other aspects of planning and analysis related to transportation programs. A professionally trained and experience-proven planner recognizes his own limitations in the many related specialized fields and depends upon specialists for detail and upon their varied viewpoints as security against inadequacy.

The program

Preceding discussions have provided reminders of two indispensable requirements: (1) The subordination of transportation plans to an integrated program of regional development; and (2) participation by highly competent specialists in analyzing the human and technical aspects of essential nonengineering factors in the program.

In other sections of this report, concomitant fields of planning are discussed in some detail. It is important at this point to sketch interrelations of transportation to some of these factors.

The epidemic of roadbuilding proposals and appropriations spurring highway construction needs a counterstimulant in reason and meditation.

1. Programing starts with an effort to observe humans not only in the physical aggregate but, even more important, individual and group hopes and aspirations. Intercounty and interresidence migration, so pronounced in this region, is in part a move to new homes, but probably fundamentally a hopeful step toward realization of idealized cultural, esthetic, and social values.

2. Too many residential developments lack essential community facilities. In the case of Federal services, the Government chooses the site and the community and employees respond. Before people change residences or the employing organization is moved, the planners should have determined the most faborable potential use of the land. A second consideration, therefore, is the land-use pattern to be programed in the region: Agriculture, manufacture, commerce, service, transportation, residence, recreation, etc.

3. In planning transportation, it is important to consider again not only the provision of adequate facilities and service but, even more carefully, the location in relation to other uses and to resources. In agriculture, for instance, the prevailing tendency is a decrease in farm population accompanying an increase in total population. This means that the productivity per person remaining on the farm must increase to feed other people; the nonhuman factors in this increased productivity are land and plant and equipment. Where unbroken expanse of farmland is needed for the efficient use of machinery or for grazing, transportation routes should not interfere.

When these and other competitive uses have been studied, transportation programing still faces the problems of traffic system integration and diverse facility planning. Planners will be faced with the following considerations:

1. At what future time will the rate of automobile purchase taper off because of barriers of family incomes, street and highway congestion, the parking and storage limitations, as well as an increase in satisfying alternatives?

2. Between which locations should public group transportation be emphasized: (*a*) to avoid congestion, (*b*) to provide faster schedules, and (*c*) to reduce costs of transportation to communities and individuals, whether these costs be in fuel, upkeep, tension, air pollution, accidents, or in enforcement of public regulations? The group transportation facilities may range from underground to aerial.

3. At what future point will the limit be reached of the usefulness of the present truck, van, and auto-carrier type of hauling in contrast to nonstreet and nonhighway conveyance?

4. What contributions will be made to the rehabilitation of our cities by returning the community to pedestrians? As sections need rehabilitation, demolishing of old structures, reducing the ground area of replacements, and establishing parks and cultural centers tend to draw residents.[28]

5. What are the relations to traffic, to offstreet parking, and to open-space zoning requirements of the efforts of merchants and financial institutions to provide shopping facilities in the form of drive-in windows and platforms?

[28] Significant experiments are available for study and for continued observation and evaluation in other cities: Boston, Cincinnati, Chicago, Cleveland, Detroit, Fort Worth, New York, Philadelphia, Pittsburgh, Toronto. Among noted architects and planners participating: Victor Gruen, Ludwig Hilberseimer, Lewis Mumford, Eliel and Eero Saarinen, Mies can der Rohe, Frank Lloyd Wright, Minoru Yamasaki.

This type of physical accommodation to service obviously has strict limitations. Planners, by specifying definite forms and areas of development, may release the ingenuity of the business community to concentration upon less ephemeral concepts and devices, including adjustment to comprehensive systems of transit. Theaters and other amusement places of course also are involved.

6. What are the feeder-transit needs of factory, store, and office worker in relation to special locational problems?

7. What should be the dimensions of a comprehensive system of rapid public transportation to replace many of the commuting shopping, and entertainment trips into the large cities now carrier by private automobile and inadequate bus and trolley service?

To avoid an assumption that there should be a city hub of limited area as a destination, the rapid transit lines should not be planned as radial but as trunk lines, with interconnecting, interchanging, and shuttle services. The private automobile trip for commuting to work should ultimately be negilible in volume in the large city.

In periods of development and transition, the connecting or intertrunk traffic could be carried by trolley or bus without construction of superhighways, since distances would not be long and speed is not a major consideration. Where more permanent installations are planned, but not of a rapid transit character, streetcars excell buses in general comfort and pleasantness, since the rail is smoother and electric power has no exhaust fumes.

8. In planning extensive outdoor recreational facilities, what should be the location and characteristics of access roads for buses and private automobiles until the demand warrants rapid transit on the periphery? Highways and parkways should neither enter nor cross parks and wilderness areas.

Recreation

An official statement of the Governor of Pennsylvania reads: "Our goal is a State park within 25 miles of every resident of the Commonwealth of Pennsylvania." [27]

Among frequent distressing errors in conceptual approaches to planning is a failure to include among human needs adequate parks and wild natural preserves, and contrarily, a tendency to regard present publicly owned open space, and even established parks, as the cheapest setting for new highways, public buildings, or service facilities. Sometimes uses alternative to industry are ignored in a jurisdictional struggle for new tax bases: "For 2 years now the Potomac Electric Power Co. has been trying to build a new generating plant on the Potomac. The company has bought land on both the Virginia and Maryland shores of the river, and stirred up a hornet's nest on both sites: Maryland wants the Pepco tax plum. Ditto Virginia. Both States have well-established prerogatives on the Potomac River." [28]

Approaches to relative uses of land too frequently are based upon current market prices. As urban communities spread into farm, forest, or dormant spaces, the assumption tends to be that the disposition of each parcel rightfully follows the highest bidder. This assumption needs reexamination in terms of prospective land capability and the greatest contribution to public welfare. The casual reader may assume that economic value is the equivalent of cost of construction and maintenance; but this confuses economic with an accounting-engineering concept. The economist does deal in monetary units, as well as units of physical productivity and other quantitative measures, and he is interested in relations between consumption demand and production supply. But he does not assume that the price tag of land, or the number of fishing lures or golf balls purchased, or backyard broilers constructed, are measures of the demand for recreation; he knows that the market does not adequately register the demand for recreation in competition with other needs or uses.

Costs of preempting wilderness areas are less at present than they will be in subsequent generations when condemnation and redevelopment may be necessary. As urban life becomes increasingly complicated, human tensions will require accessible areas of sky, forest, and streams.

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[27] Pennsylvania's New State Parks, a Report to the General Assembly, April 15, 1957. Under an act requiring rents and royalties from oil and gas leases of Commonwealth land to be placed in a special fund to be used for conservation, recreation, dams, and flood control.

[28] News Letter, the Interstate Commission on the Potomac River Basin, March 1957.

The eastern part of the United States is rapidly losing its open spaces; and it is deplorable that the public and officials have been so lethargic. Significant acquisitions occurred in the Potomac Basin 20 years ago. As recently as 1936 the Shenandoah National Park was acquired, in part by public subscription, and formally established. The very narrow stretch of park along the Maryland shore of the Potomac River from Washington to near Cumberland, Md., including the historic Chesapeake & Ohio Canal, is a scenic stretch of nature with easy access to the public for 185 miles. It was purchased by the Federal Government in 1938. Other smaller but important areas have been set aside by States, ranging from mountain and valley public parks to coastal strips.

Program for recreation

In constructing programs for allocation of land and facilities for recreation purposes, criteria should include (1) the relation of recreation to a multipurpose, integrated plan; (2) a human consumption need rather than developer's desire; (3) a long-term rather than a current utility; (4) a range or variety in types of informal recreation—boating, canoeing, hiking, climbing, camping, swimming, skiing, skating, fishing, bicycling, and picnicking.

It is readily evident that plans for highways, dams or factories, developed without reference to other area essentials, destroy locations ideally adaptable to recreation or other uses. To support a large dam with the argument that it will provide recreational opportunities is to ignore unfortunate experiences in other parts of the Nation, including access through mudflats. Specifications are in order. In allocation of available land for different purposes, all possible uses must be kept in mind.

Large capital investment in machinery and equipment is not necessary for enjoyment of the out of doors. The many youth organizations enjoying hiking, camping, and woodcraft, are not dependent upon artificial trappings. Adults fishing, hiking, strolling, bird watching, picnicking, or ruminating require uncontaminated streams, forests, meadows, or hills. These, together with the more strenuous participants, are the real consumers. Beyond conservation and preservation, the principal need is a modest access road.

Preferences in recreation vary with many factors, age, sex, habit, location, and health. Commercial enterprises catering to entertainment seek the common denominator which will bring maximum profit. Nature demands no profit and offers so bountifully of its diverse enticements that individuals are readily served. Consequently, the planner does not have the responsibility of creating this facility, but of protecting it.

In addition to making parks available within easy reach of urban areas, it is important to provide opportunities for extended hiking and camping trips into primitive, primeval and wilderness areas. These areas of sanctuary for human and wildlife require protection from the noise and fumes of motors, whether attached to automobile, cycle, boat, or airplane, and of the thunder of jets.

Some States are providing not only camping space with water and toilet facilities, but, in addition, tents with cots and bedding which can be rented by the day or longer. In western Massachusetts, not far from the musical center of Tanglewood, there is a State camping area with tents and equipment available.

While central lodges and inns are a feature of many State and national parks, the cabin is important for its isolation from social pressures and usually its secluded setting.

Water, whether sea, bay, lake, or stream, contributes to human recreation and relaxation, provided inroads of mechanical gadgets are not permitted. The speedboat destroys the serenity so important to human rehabilitation, with its noise, exhaust fumes, and actual danger of swamping other craft or of interfering with swimmers. Consequently, special areas need to be designated for races and skill events.

Winter recreation also is important and, in this region, should include skiing, snowshoeing, tobogganing, and skating, and perhaps iceboating as well. In sections deprived of snow and ice, hiking remains a stimulating experience.

In the whole of the Potomac River Basin, there is only one national park: Shenandoah National Park. It is the model for others needed between the Chesapeake Bay and the Ohio River Basin.

Pennsylvania, Maryland, Virginia, and West Virginia have some excellent parks, but they are too few, and in general limited in scope.

In the Potomac River estuary adequate resource development is stymied by pollution, particularly above Quantico, Va., and Indian Head, Md., and by areas of military operations, including proving grounds and ordnance depot. In the

upper Potomac Basin there are areas of acid mine drainage in coal areas, and municipal sewage and industrial waste in several locations. These menaces to health affect both humans and wildlife.

Washington and Baltimore are deprived of adequate public parks in their immediate environment, and face encroachment upon present open areas such as the Chesapeake & Ohio Canal and Glover-Archbold Park in the District of Columbia, and of Patapsco and Patuxent natural areas near Baltimore.

A great contribution to future generations would evolve from national acquisition of the Appalachian Trail extending from Maine to Georgia, and including more than 200 miles in the Potomac River Basin.

A proposal has been made that governments should acquire a given number of acres of land for public enjoyment for every mile of highway constructed.

Plans proposed by individuals and organizations, which have reference to all areas of this large region, are available for consideration by official planning agencies. Many of these plans include suggestions for financing. It is essential that recreation be recognized as a major factor in regional programing, and that integrated planning for the area be initiated at once.

GOVERNMENTAL COMPLEX

Multiple political jurisdictions have authority whithin the Potomac River Basin. The Federal Government, the States of Maryland, Pennsylvania, Virginia, and West Virginia, and the District of Columbia are basically involved.

The Federal Government plays its usual role, exercising over the Potomac River the powers over navigable rivers; in addition, it has authority within the District of Columbia. Counties and municipalities, of which there are 49 in the Washington metropolitan area alone, are responsible in matters of zoning, planning of streets and parkways, drilling of wells, location of bridges, public utilities, and other functions which directly or indirectly affect the surrounding area.[29]

There are duplication of effort and parallel programing, not only between these different jurisdictions, but too frequently within the respective jurisdictions as well. Lack of coordination is noted by the Compact Study Committee of the Interstate Commission on the Potomac River Basin: "* * * there is no overall coordination of the technical programs conducted in the several States where study and investigation of pollution problems may be in progress"; and "In the Luke-Cumberland area * * * there is at this time much work in progress on the Maryland side of the river which should result in the reduction or elimination of most of the damaging pollution entering the river and its tributaries from that jurisdiction (but) there is * * * no corresponding activity covering nearby communities in West Virginia."[30]

The confusion around the planning of a road link between the street system of the District of Columbia and new United States Route 240, also called the Washington National Pike, may serve as an example of both inter- and intra-jurisdictional conflicts. In 1953 a new Route 240 was made part of the master plan of highways for the Maryland-Washington regional district as well as of the 12-year program of the Maryland State Roads Commission. No agreement has been reached between the Department of Highways of the District of Columbia, the National Capital Planning Commission, the National Capital Parks (a field office of the National Park Service of the Department of the Interior), the Maryland State Roads Commission, and the Maryland-National Capital Park and Planning Commission as to whether an extension into the District should be recommended. All plans and final cost estimates will have to be approved by the Bureau of Public Roads of the Department of Commerce, since the new expressway will be part of the Federal Interstate System, 90 percent of the cost of which is borne by the Federal Government.[31] If a route along the Po-

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[29] For example, a Maryland law of April 10, 1957, applicable to Montgomery County (Maryland Laws, 1957, ch. 596, sec. 1) provides that "neither the Maryland-National Park and Planning Commission nor the Montgomery County Planning Board * * * shall exercise any planning or zoning power * * * the authority for which is derived from the Maryland-Washington Regional District Act within the area of any municipal corporation * * * lying * * * within the area hereby added to the Maryland-Washington Regional District * * *. Contrariwise, two other Maryland laws of April 10, 1957 (Maryland Laws, 1957, ch. 698 and ch. 699) which add certain areas in Prince Georges County to the Maryland-Washington Regional District, prohibit "municipal corporations within said areas from exercising powers relating to planning, subdivision control, or zoning."

[30] Interstate Commission on the Potomac River Basin, Compact Revision Report, 1957 pp. 8. 14.

[31] Federal Aid Highway Act of 1956, Public Law 627, ch. 462, 84th Cong., 2d sess., sec. 108 (c).

tomac River is decided upon, approval of the National Park Service may be required, since the "protection * * * of the Chesapeake & Ohio Canal" may be at stake.[32]

An attempt to overcome the difficulties created by the maze of Federal agencies concerned with our water resources seems to be symptomatic of the situation within the various jurisdictions. The Interagency Committee on Water Resources was created to coordinate the activities of the Departments of the Army, Interior, Agriculture, Commerce, Labor, and Health, Education, and Welfare, and the Federal Power Commission. The efficiency of such a superimposed coordinating committee seems doubtful, as long as the established agencies continue to exercise their old prerogatives.

Other efforts have also been made to coordinate the activities of different agencies. However, many agencies have been limited to an advisory status. The Interstate Commission on the Potomac River Basin, the Maryland-National Capital Park and Planning Commission, the Northern Virginia Regional Planning and Economic Development Commission, and the National Capital Regional Council are among advisory organizations of long standing. But in the experience of the Interstate Commission, for example, it "* * * has so far never been successful in securing the concurrence of the signatory bodies with its recommended water quality criteria."[33]

The need for more effective cooperation between and within the jurisdictions has recently brought about the creation of the Joint Congressional Committee sponsored by Representative Hyde and Senator Beall of Maryland.

Current studies tend to isolate their particular problems and thus greatly reduce the value of the end product, such as the investigation of pollution in the Potomac River by the Public Health Service; of dams and reservoirs in the basin by the Corps of Engineers; the Metropolitan Washington Mass Transportation Survey sponsored by the National Capital Planning Commission.

A new and bolder approach appears to be indicated, for which there are precedents in other parts of this country. The following are possible alternatives to present chaos:

1. An authority established by interstate compact to which could be assigned one problem or a group of related problems, possibly in part along lines suggested in the recent report of the Compact Study Committee of the Interstate Commission on the Potomac River Basin.

2. A system of Federal grants to States and smaller units of government, conditioned upon standards to be met.[34]

3. A Federal Potomac River Valley Authority.

Realism requires recognition that power complexes develop in the operation of any structure, whether established by legislation, by political pressures, or by pervasive influence of groups having representation on various commissions. As an illustration, the influence of the Corps of Army Engineers may be gaged by its memberships, direct or ex officio.

Influence of the Army engineers

1. Direct functions: The Chief of Engineers administers the laws protecting and preserving navigable waters and harbors of the United States; all construction and maintenance work for the above assignments, and for flood control and other water uses; and approves plans for bridges over navigable waters. He supervises the Washington aqueduct and other public works and improvements in the District of Columbia not otherwise specifically allocated by law.

2. Board of Commissioners of the District of Columbia: One of the three Commissioners is selected by the President from the Corps of Engineers. The President also has authority to detail from the corps 3 officers to act as assistants to the engineer commissioner; 2 are currently assigned. The District of Columbia Department of Highways also is under the direction and control of the engineer commissioner, as is the Department of Sanitary Engineering.

3. National Capital Planning Commission: The Chief of Engineers and the Engineer Commissioner of the District of Columbia both are ex officio members. Only 5 of 12 members are not ex officio.

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[32] 16 U. S. C. 17j–2 (d).
[33] Compact Revision Report, 1957, p. 13.
[34] Some existing Federal laws would need to be made more effective, such as the Watershed Protection and Flood Prevention Act of August 4, 1954, Public Law 566, 83d Cong., 2d sess., 86 Stat. 666, as amended by Public Law 1018 of August 7, 1956, 84th Cong., 2d sess.; or the Water Pollution Control Act Amendments of 1956, Public Law 660, 84th Cong., 2d sess.

4. Interstate Commission on the Potomac River Basin: A member of the staff of the Chief of Army Engineers is 1 of 3 Commissioners representing the Federal Government.

5. National Capital Regional Planning Council: The Engineer Commissioner of the District of Columbia is an ex officio member. Eight other members are nominated by local jurisdictions.

6. Planning Advisory Council of the Board of Commissioners of the District of Columbia: The Chief of Army Engineers immediately preceding the incumbent has been appointed as a member.

7. Public Utilities Commission of the District of Columbia: The Engiener Commissioner is an ex officio member; there are two other members.

8. Zoning Commission of the District of Columbia: District Commissioners, of which one is an Army engineer, are ex officio members.

ANALYTICAL OBJECTIVITY

In regional or urban[35] analysis, as in other fields so closely concerned with human problems, research activities are largely dependent upon indirect approaches and procedures. Members of human society cannot be placed in a test tube, or control chamber, for observation, as in physical and natural sciences; moreover, the individual reaction varies in isolation and in social relations.

Reference also needs to be made to possible confusion in use of the terms "economic" and "social" welfare. The difference is not in emphasis upon the individual as against the group, nor in the aggregate of behavior as against the effect upon the person. In fact, economic concepts are weighted with concern for social welfare: The real income, the purchasing power of money income; and not only the productivity of the worker in output per hour, but even the deleterious effect upon that worker of assembly-line technique. Consequently, the interest extends to leisure time and opportunities for its enjoyment. Emphasis in planning should be upon inclusive research: physical, natural, economic, sociological, governmental, psychological, aesthetic.

In analytical procedures, efforts are made to measure size, change, and interrelationship, whether aggregates or individual cases are involved. And though continual progress is recorded of the yielding of fields to objective and quantitative analysis, there remain large areas for exploration in which subjective and qualitative considerations are dominant. Questionnaires and interviewing, so widely used in transportation and trade surveys, are precarious techniques. For instance, in recording some reactions, approximate patterns in a cohesive group may be anticipated and consumption quantities estimated, if a pervasive factor such as basic religious creed is known and is of major significance.[36] But in a cosmopolitan area diverse patterns are almost individual in structure. Changes in recreational preferences frequently are functions of age, family, and occupational status. Occupational factors may determine preference for use of a parcel of land for farm, factory, or recreation, sometimes in relation to aspiration rather than to realization.

The family, our basic social unit, is a variable in the activities of its members and in external relations. In the purchase of personal and home articles, choice of individual members varies as related to utility, prestige, and aesthetic values. In careful, objective surveys, it has been found that members of families respond differently in separate and in group interviews.[37] The male's asendancy in the privacy of his office may have little resemblance to his position in the family decision; frequently the forthrightness of children pierces the pretense of their parents when the family makes an effort to specify the determining factors in specific choices. In planning research, such experiences must be recognized.

How difficult it is under these conditions for the research person to retain a strictly scientific aloofness; a real strain is imposed upon his human reactions. Consequently, it is even more difficult for the casual, untrained observer to undertake a project and to evaluate the results. Moreover, a person trained in a physical field, where conditions of experiments may be controlled,

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[35] This publication does not concentrate upon the urban community and its problems. The city is considered only in relation to the region of which it is a part.

[36] John H. Cover, Neighborhood Distribution and Consumption of Meat in Pittsburgh, University of Chicago Press, Chicago, 1932.

[37] University of Maryland, Bureau of Business and Economic Research, Harford County, Md., Studies in Business and Economics, vol. III, No. 3, December 1949.

and where mathematics is a constant aid, may place too great credence upon the record of project results and upon the significance of formulas in the fields of the social sciences. Out of this uncritical approach has emerged a cult of mechanical forecasting; the mathematical formula, like a machine, is available for the input of raw material which will be converted into a product called prognostication.

The reader of the literature of regional, urban, or general analysis and planning will find expressions and terms snatched from the physical sciences or from the ether. This activity and adaptation indicates the stage of development in these fields. The initial, trial-and-error stages of emerging fields are imitative in their struggle for definitive status. Scientific terms are corralled for their prestige values, and the commercialization of the procedure is underway.

It is doubly unfortunate if competetent research results are distorted to fit preconceptions, or if predetermined goals are set.

Laws and inlawry

In this amorphous field, the professional and the layman will read of laws and tools, sometimes used interchangeably. Prominently discussed are rank-order-size relations, gravity model, and potential models. The rank-order-size relationship merely attempts to list cities in the order of size and to use this relationship in guessing the worth of various metropolitan areas. The gravity model assumes that trade between two areas is related to distance and to populations. The potential model records the position of one region relative to other regions and to national growth, using distances and estimated income, and bases projections upon changes in these positions.

Another pervasive term is "coefficient." In satistical method, a coefficient of correlation represents an indicator of relationship, whereas a coefficient of alienation is a measure of the absence of relationship. In the regional field is to be found, among others, a coefficient of localization, which is proposed as an aid to determining the extent of divergence of a regional pattern of industry from the national pattern, with industries and employment used as factors.

Impressive formulas are suggested for various relationships, but it is important to realize that no "laws" have been established and that "inlawry" is therefore illegal. Work in these fields is preliminary and highly experimental.

Master plan

The foregoing appraisal of the District of Columbia-Potomac River Valley development problems indicates conclusively that there are many aspects of this problem which need careful study and that all of the various problems are inseparably interrelated. No program for the fulfillment of the region can possibly be successful unless it frankly accepts the need for acquiring much more information than is now available with a recognition of the vital interdependence of the many aspects. Consequently many present proposals with respect to highways and dams are likely to prove abortive or deleterious to total development.

The accompanying research outline includes some of the important areas of investigation which must be thoroughly explored before planners can move ahead on a rational basis. Once the planners have been given these essential data and analyses, they can then proceed with the task of developing a final program and master plan. This plan will have a number of aspects. Basically it will include a master plan and land-use program for the entire District of Columbia-Potomac region. Equally important is the statement of steps and methods for achieving these objectives described in the master plan. It should be clear that none of these problems exists in isolation and that the plan must make provisions for the entire Potomac region, just as the individual objectives of the program must all be considered in terms of their interrelationships.

Although the immediate goals of the regional plan will center around the physical aspects of land and resource use, zoning, water supply and control, and transportation networks, these aspects are actually secondary to the overall development goals of the region. The basic goals will arise from the research problems discussed above and will relate to planning in a region centered around a national capital and international cultural center. In a period which will probably witness greater population and rising incomes with probable increasing domestic and international tensions, goals for the development of this region must be spelled out in terms of the national and international responsibilities as well as individual and community human objectives. Specifically, the goals should differentiate between acceptance of unplanned haphazard growth and the deter-

mination of acceptable rates and directions of growth. The goals must include statements concerning the desirable density of population and buildings and a preference scale between white-collar, cultural, service, or business and manufacturing types of employment.

These basic policy decisions will then be embodied concretely in zoning and land-use plans. Realistically, the land-use plan must recognize a dynamic context in which development is continuous. It must begin with current conditions and proposed concrete steps towards achieving an orderly development of objectives which themselves will probably be modified with the passage of time. There is ample opportunity for new and imaginative thought in planning for land use in the District of Columbia-Potomac region. For those areas of low-density development with high priorities upon open space, new devices should be considered for removing temptation from the paths of speculators whose interest is to sell land to the highest bidder regardless of the use to which it is put. Recent proposals have included reduction of taxes for land withheld from development, and advanced public purchase of land for anticipated parks and highways, and for protective purposes. A new and positive type of planning is indicated which would reserve residential areas of various densities and specify locations for essential services, business, and recreation on a balanced basis.

The regional land-use plan should also specify the relationship of the central city to its suburbs and satellites on the basis of needs dictated by functions of specialized communities, dispersal, and specialization. This broad type of planning will provide the basis for development programs of the cities and communities included within the region. IV.

Comprehensive Research Outline

LAND-USE AND RESOURCE PLANNING

I. Delineation of the area: I.
- A. Geographic location.
- B. Physical characteristics: topography and physiography, soils, climate, natural resources.
- C. Political boundaries and governmental jurisdictions.
- D. Economic characteristics and relations with adjacent area.

II. Historical development: II.
- A. Settlement patterns.
- B. Land ownership patterns.
- C. Agricultural development trends:
  1. Crop production, acreage, productivity, prices.
  2. Livestock numbers, productivity, prices.
  3. Soil management practices.
  4. Labor utilization, productivity.
  5. Mechanization.
- D. Forest resources:
  1. Government policy and control.
  2. Lumber industry.
  3. Conservation measures employed.
- E. Mineral resources: III.
  1. Coal deposits.
  2. Other minerals.
- F. Industrial development:
  1. Market orientation.
  2. Resource orientation.
  3. Power facilities.
  4. Mechanization and automation.

III. Considerations in planning future land development:
- A. Agriculture:
  1. Present farm land use.
  2. Soil types and capabilities.
  3. Conservation practices in use, needed.
  4. Irrigation.
  5. Labor supply and requirements.
  6. Mechanization.
  7. Land values.
  8. Alternative land use.

B. Forestry:
1. Present land use.
2. Ownership patterns.
3. Types and uses of wood.
4. Forest management practices.
5. Alternative land capabilities.

C. Recreation:
1. Specific areas within basin.
2. Level of use and capacities.
3. Estimated future needs.
4. Potential area for future development.

D. Industrial land use:
1. Present industrial pattern.
2. Trends in industrial land acquisition.
3. Mechanization and automation.
4. Manpower availability.

E. Highway development:
1. Current highway network.
2. Estimated needs.
3. Impact of proposed construction on land-use patterns.

F. Urban land use:
1. Description and delineation of urban areas.
2. Trends in urban land use and development.
3. Metropolitan area as regional center.

IV. Land-use planning:
A. Present status of planning.
B. Impact of current proposals.
C. Alternative proposals.

WATER REQUIREMENTS AND WASTE DISPOSAL

I. Water requirements:
A. Residential:
1. Per capita, for each region, trends over time.
2. Urban, suburban, rural.
3. Legislative aspects.

B. Recreational: multiple needs.
C. Irrigation.
D. Industrial.

II. Water supply:
A. Ground water.
B. Potomac:
1. Variations in rates of flow seasonally, annually.
2. Effects of possible soil conservation measures.

C. Other rivers and creeks:
1. Patuxent.
2. Occoquan.
3. Other.

III. Disposal:
A. Costs, advantages, disadvantages of alternative methods.
1. Full treatment plus disposal in the bay (Wolman).
2. Full treatment plus disposal in lower Potomac (below salt line, avoiding algae growth).
3. Number 2 above plus effluent-and-saline barrier with bridge across lower Potomac.
4. Full treatment plus effluent utilization on farm land.
5. Full treatment plus evaporating basins.
6. Full treatment plus use of sludge for fertilizer.
7. Radiation to supplement normal full treatment.
8. Separation of storm sewers and sanitary system to prevent sanitary overflow; disposal of storm sewers into sanitary, by pumping if necessary.
9. Cleanup of small streams flowing into Potomac; disposal into sanitary system by pumping if necessary.

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B. Disposal areas:
1. Carrying capacity:
(*a*) Potomac.
(*b*) Patuxent.
(*c*) Chesapeake Bay.
2. Financial and social costs.
C. Legislative aspects:
1. Criteria and enforcement practices of jurisdictions.
2. Federal and state assistance.
3. Interstate responsibility for downstream conditions.

INDUSTRIAL DEVELOPMENT AND LOCATION

I. Objectives:
A. Optimum population growth rates:
1. D. C.-metropolitan area.
2. Potomac River Valley.
B. D. C.-Potomac regional master plan:
1. Residential-commercial balance.
2. Park and open space requirements.
3. Role of satellite communities.
4. Dispersal policy:
(*a*) Government agencies.
(*b*) Business, industry, national defense.
II. Economic problems:
A. Alternative income sources:
1. International, Federal, State, local government.
2. Government-oriented activity (research, trade organizations).
3. Metropolitan-oriented activity.
B. Pressures for and against economic development.
III. Development considerations for individual communities:
A. Background considerations:
1. Basic community goals and objectives.
2. Urban-rural land balance.
B. Marginal costs of community expansion:
1. New or incremental water supply.
2. Sewage disposal.
3. Services, schools, roads, other.
4. Extent of unused capacity.
5. Per capita, per family cost of new facilities.
6. Per capita, per family fiscal capacity.
7. Industrial wage structures.
C. Specific industry locational features:
1. Wage rates.
2. Water requirements.
3. Environmental hazards, including air and water pollution.
4. Industrial requirements for utilities and services.
5. The role of organized industrial districts.

TRANSPORTATION

I. Basic considerations:
A. Relation of transportation to other regional factors:
1. Human activities: jobs, cultural and social functions.
2. Patterns of land-use potentials.
B. Time aspects:
1. Plan to meet future needs.
2. Diverse tendencies by localities and in time.
C. Coordinate staff; integration in planning.

II. Types of transportation facilities:
  A. Possible tapering off of rate of automobile use:
    1. Family incomes and budgets.
    2. Street and highway congestion.
    3. Parking and storage limitations.
  B. Public group transportation emphasis:
    1. Avoidance of congestion.
    2. Fast schedules.
    3. Unit costs to patrons and community.
    4. Type for designated purpose and location.
    5. "Feeder" systems between main routes, and within cities.
  C. Commodity conveyance:
    1. Limits of present truck, van, auto-carrier in modern city.
    2. Planned substitutes.
III. Recognition of the pedestrian in urban areas:
  A. Short-distance intracity commuting.
  B. Locations of services.
  C. Open space and freedom from traffic.
IV. Drive-in service:
  A. Relation to traffic congestion.
  B. Limits of service of this kind.
V. Pattern of transport system:
  A. Related to land use and patron use.
  B. Avoidance of stereotyped assumptions of the "wheel," its hub and spokes.
  C. Nonsurface rapid transit system.

RECREATION

I. Modern concept of planning:
  A. Protection of public interest against predation.
  B. Long-term rather than current utility.
  C. Variety of types of recreation needs.
  D. Each factor in correlative, integrated plan.
II. Increasing human need for unspoiled nature:
  A. Curative value of nature.
  B. Open areas for short or leisurely recourse.
III. Recreational opportunities:
  A. Open spaces in business and residential areas:
    1. Lot sizes, building setbacks, limited heights of structures.
    2. Streets and transportation related to the "return of the pedestrian."
    3. City and regional parks for easy recourse.
    4. Aesthetic values of trees, lawn, gardens, wildlife.
  B. Regional parks, wildlife sanctuaries, wilderness areas:
    1. Large parks of varying topography, diverse recreational optunities, and cottage and camping facilities.
    2. Extensive wild natural areas with minimum of development.
  C. Protection against inroads by nuisances:
    1. Problem of the concessionaire.
    2. Noise factor and air contamination.
    3. Ingress or access roads versus transmission routes.
    4. Rights of access.
    5. Encroachment for logging, grazing, etc.
    6. Wildlife sanctuary.
  D. Variety of consumer interest:
    1. Group and individual, disparate needs.
    2. Nature of use: resting, picnicking, strolling, hiking, fishing, boating, canoeing, climbing, swimming, camping, bicycling, skating, skiing.

IV. Integrated plan with emphasis upon region:
- A. Soil, topography, other resources.
- B. A guided development of communities.
- C. Circumscription of manufacturing and related plants to specific areas.
- D. Transportation routes and facilities related to decentralization.
- E. Establishment of priority allocations among factors.
- F. Governemental structure:
  1. Professional levels of research and planning.
  2. Impartial setting for administration.

GOVERNMENTAL COMPLEX

I. Multiplicity of jurisdictions:
- A. Federal Government functions and authority.
- B. Differences in constitutional and legislative provisions in States.
- C. Specific powers of local governments: Counties and communities.

II. Special units:
- A. Research and planning commissions.
- B. Administrative authority.
- C. Advisory responsibilities.

III. Overlapping authority:
- A. Nature and legal source.
- B. Duplication of effort and pronouncements.
- C. Efforts at coordination.

IV. Interlocking representation:
- A. Pervasive functions.
- B. Political representation.
- C. Power complex.

V. Structural and functional proposals:
- A. Interstate compacts.
- B. Federal conditional grants for specific purposes and standards of operation.
- C. Federal Potomac River Valley authority.
- D. Other reorganization patterns.

VI. Public finance:
- A. Inroad upon research and planning.
- B. Specialized professional function.
- C. Coordination with administration.
- D. Types of revenue: Incidence.
- E. Budget allocations.
- F. Comparative, break-even point of analysis.
- G. Government jurisdictions.
- H. Pooling of finances.

I. Concept and description of metropolitan areas:
- A. Physical-geographical setting in relation to region.
- B. Neighboring communities and interrelations—satellite status.
- C. Dynamics and limitations of projections.

II. Population:
- A. Aggregate, changes, and characteristics.
- B. Relations to other cities and to suburban communities.
- C. Mobility: Shifts within and among urban areas.
- D. Locations and concentrations in relation to characteristics.
- E. Labor force in relation to population.

III. Occupation and employment:
- A. Employment and unemployment.
- B. Labor market tendencies:
  1. Skills.
  2. Wages and wage rates.
  3. Wage differentials: Industries, skills, sex, regional.
  4. Policies and regulations: Government, union, employer.

IV. Land use and zoning:
- A. Emphasis upon amenities for living.
- B. Importance of open space, parks, recreational opportunities.
- C. Building setbacks and offstreet parking.
- D. Requirements of the pedestrian.
- E. Industrial "park."
- F. Commercial "plaza."
- G. Control of air and water pollution.
- H. Accessibility relationships: Multiple "centers."

V. Accessibility and transportation:
- A. Access by foot the ideal: Job, shopping, recreation.
- B. Multiple centers as conservers of transportation.
- C. Basic transportation system:
  1. Public group or "mass" transportation.
  2. Automobile a cost and traffic liability for commuting.
  3. Peripheral areas and adjacent communities interchange.
- D. Alternate system models as basis for analysis.

VI. Economic balance:
- A. Living amenities as basic; consumer welfare viewpoint.
- B. Diversification of industry: manufacture, trade, service.
- C. Immigration policy for business accessions:
  1. Failure and liquidation probabilities.
  2. Imbalance and unemployment.
  3. Tax-base criterion, uses and limitations.
- D. Resource use and development.
- E. Energy source and efficiency changes.
- F. Financial and credit structures.
- G. Variables in productivity.
- H. Public utilities and service to the public.
- I. Barometers of community welfare:
  1. Public health.
  2. Employment by occupation, industry, sex, age.
  3. Income per capita and by source.
  4. Measures of stability; pattern of diversity.
  5. Economic-business conditions.

VII. Government:
- A. Interrelation of functions; State, county, community.
- B. Coordinate planning and administration.
- C. Demand functions for services; education, sanitation, fire, police, maintenance.
- D. Expansion elasticity; plant and service capacity.
- E. Expertness of personnel; planning, administrative, service.
- F. Public interest and political morality.
- G. Ordinances, services, and public welfare.
- H. Financing and planning:
  1. Inclusive plan on extended long-term basis:
     a. Financing by tax assessment, fee, borrowing.
     b. Solvency by priority-project schedule.
  2. Taxation:
     a. Influence as business location factor small.
     b. Factors with greater priority; stability, resources, services, climate, fresh air, open space, natural recreational areas.
     c. Tax rates and "quality" growth potentials.
  3. Cooperation among communities and counties:
     a. Water supply, control, and allocation.
     b. Sanitation; refuse disposal.
     c. Recreational facilities.
     d. Cost economies related to scale of operation.
  4 Rehabilitation of urban areas:
     a. Role of private investment.
     b. Community credit and municipal bond market.

VIII. Esthetics:
- A. Parks and open spaces; foliage, color, vista.
- B. Community layout.
- C. Use of topography, water courses, etc.
- D. Public building architecture and construction materials.
- E. Zoning for beauty and tranquillity.
- F. Absence of air and water pollution.

RESEARCH

I. Methods indirect in regional and urban research:
   A. Human individuals and groups are in question.
   B. Controlled experiment is alien.
   C. Social sciences attempt to identify and measure "welfare."
   D. Planning needs research in physical, natural, social sciences.
II. Objectives include measurement of size, changes, interrelationships:
   A. Quantitative, objective aspects.
   B. Qualitative, subjective considerations.
   C. The family a variable unit; members as individuals.
III. Aloofness and objective observation:
   A. Trained and skilled person versus casual participant.
   B. Acceptance patterns of uncritical.
   C. Dangers of projections.
IV. Emerging fields:
   A. Terms and methods borrowed.
   B. Danger of manipulation.
   C. Absence of checks and tests.
V. Project methods:
   A. Product and income.
   B. Flow of funds.
   C. Balance of payments.
   D. Interindustry; input-output.
   E. Economic and business barometers.
   F. Survey; sampling.

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[1] Out of print.

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Representative HYDE. The next witness is Mr. Kennedy.

STATEMENT OF DR. HAROLD KENNEDY, DIRECTOR OF HEALTH FOR THE FALLS CHURCH HEALTH DISTRICT, VIRGINIA

Dr. KENNEDY. I have no prepared statement, sir. I would like to make it clear, though, at this point, that at no time have I appeared. I am prepared to answer any questions that the committee wishes for the record.

Representative HYDE. You say, "What was the question?" Or did you mean there was some difference of opinion as to whether or not you could make any valuable contribution, or what?

Dr. KENNEDY. I think that's the gist of it.

Representative HYDE. Well, specifically, Doctor, what we would like to know from the health officers in the Washington metropolitan area is what recommendations, if any, they have for the improvement in the handling of sewage and other forms of pollution in the area.

Do you think that the present method of regulating it and controlling it, from the health standpoint, is adequate, or do you think the present method of dealing with sewage and the operation of our sewage plants is adequate? Those are the things that we are interested in on this committee.

In other words, we are studying the water and its related problems, sewage and pollution, from the standpoint of the Washington metropolitan area, and we want to find out if the present methods are adequate or whether some change would help, and, to be more specific, I am going to ask you this:

Is public health better protected by numerous small sewage plants or by carrying sewage to central plants for discharging downstream?

Dr. KENNEDY. Well, I think that from a public health standpoint, one would prefer the collection and treatment of sewage at a minimum of points.

[1] Out of print.

I think what we might have, if nothing were done, would be detrimental to the public health. I think one has to bear in mind, though that Fairfax County, which I represent, in 1952 had a fairly alarming situation. We had something like 2,500 septic tanks malfunctioning. We had no real treatment of sewage.

We had an enormous influx of population, it amounted to something like 120,000 to 130,000. Just what could the community do at that time? I think they took a tremendous step forward in 1952 by voting a $20 million sewer program with several treatment plants. It may not have been the ideal thing to do, but I think it was the maximum that that community, with its financial ability, could do at that time.

Representative HYDE. Well, the point is that your community greatly improved the handling of the problem and the conditions that existed by consolidation within the area of its jurisdiction.

Dr. KENNEDY. Yes. All through this period, I have strongly felt that the proper approach to this thing, both water and sewagewise is on a northern Virginia basis.

Representative HYDE. Would you say that consolidation of the sewage system and treatment plants is desirable in the northern Virginia area?

Dr. KENNEDY. I would think unquestionably yes.

Representative HYDE. Is there at the present time any plan for this that you know of?

Dr. KENNEDY. Well, we took this big step and this program is just now being completed. I think this is its final year from 1952—it is a 5-year program that will finish up this year in 1958.

The county has just ordered a study of the rest of the county now, to try and help them to determine what their future program will be.

Representative HYDE. That is for Fairfax County?

Dr. KENNEDY. Yes, sir, I cannot speak for Arlington or Alexandria, sir.

Representative HYDE. To your knowledge is there any plan at the present time being studied for the northern Virginia area, that is within the metropolitan area that you know of?

Dr. KENNEDY. I don't think so.

Representative HYDE. Do you think such a plan is needed, and would it be advisable to begin making a plan or studying plans for a consolidation in the northern Virginia area?

Dr. KENNEDY. I would think so, yes.

Representative HYDE. Well, do you think that the northern Virginia—that the Northern Virginia Sanitary District, and to be more specific, could assure a better and safer sewage disposal and water supply?

Dr. KENNEDY. I don't think there is any question about it, sir.

Representative HYDE. Now, were you the health officer in 1954?

Dr. KENNEDY. Yes, sir.

Representative HYDE. As I understand it, at that time, a multiple treatment plant plan was adopted.

Dr. KENNEDY. I would think with regards to Fairfax County that this decision was made earlier than that, sir.

Representative HYDE. Well, when?

Dr. KENNEDY. There was a report in 1954 which studied Arlington, Alexandria, and Fairfax, and decided to go ahead, but I think Fairfax was committed to its present program.

Representative HYDE. To its program. Was there a report of some plan among all of the jurisdictions in the northern Virginia area adopted at that time which called for multiple treatment?

Dr. KENNEDY. I think so, yes.

Representative HYDE. Was your approval as health officer requested before the multiple treatment plant plan was adopted?

Dr. KENNEDY. No, we were not consulted. I was not consulted.

Representative HYDE. Mr. Gutheim do you have some questions?

Mr. GUTHEIM. Yes. I deduce from your answer to the earlier question, sir, that the 1954 plan was made within the frameword of some prior policy to which the county had already been committed?

Dr. KENNEDY. I would say that the thing that binds the county, was that in November 1952 there was an election held on the $20 million bond issue, and as you know, the specific of this thing and the vote that the people make on them bind the county to follow this program through.

Mr. LEVIN. If I might interject here. The 1954 report was published in 1954. However, the study began in 1951 and I think that there were 8 or 9 separate progress reports issued throughout the course of the study, so that I believe the dates can be adjusted on that basis.

Mr. GUTHEIM. I think the relevant thing we are trying to get at here is that the system of multiple plants to which the area has been committed, whether by its own decision in the bond issue, or whether by the engineering report of 1954 is an undesirable thing from a health standpoint. A regional system in which facilities would be more unified would be more desirable. I think that we are primarily interested in being sure that everyone understands that the present system is the result of these expediencies, and not as a result of what could be called professional and technical considerations of public health or conceivably, either of engineering and operating considerations.

Dr. KENNEDY. I would say that in sewage treatment, collection and treatment, that sometimes you have to do not what you consider the best for public health, but within the financial.

Mr. GUTHEIM. I appreciate there are many reasons why we are doing it.

Mr. LEVIN. We have had some testimony in the early portions of these hearings that economic considerations were not of a determining nature in the adoption of this plan for multiple treatment plants; the total cost for the multiple treatment plants was very slightly under the total cost for a combined or consolidated plant, and the two costs were so close that no decision could be warranted on that basis alone.

Representative Hyde. That is not a question, that is a conclusion.

Mr. LEVIN. No, that is a statement to clarify Mr. Gutheim's question.

Dr. KENNEDY. I think what we can do is to look at this situation and clarify it for today. One can decide it for certain areas. I am particularly interested in making steps in the right direction. There is a general consensus now that the area above Chain Bridge, to Pimmitt Run, Turkey Run, Skirt Run, and Bull Neck—there should be in all our future thinking pushed across Chain Bridge, and then on

to Blue Plains. This is a vital area above the District of water supply, and I think the general tendency and opinion would be that that area will go over to Blue Plains. This will be a big step forward.

Representative HYDE. In other words, not only consolidation in the Virginia area would be avisable, but even more consolidation and cooperation with the other jurisdictions across the river.

Dr. KENNEDY. Yes.

Representative HYDE. Now, Doctor, one thing that I have been trying to learn from the experts on this subject is the matter of health regulation of the Potomac and its tributaries.

Do you think the present method of administering and enforcing health regulations on a multiple jurisdictional basis is satisfactory, or do you think it would be improved by having more uniformity as far as administration and regulation of the health standards and practices in the river basin area are concerned?

Dr. KENNEDY. Well, let me make clear my position on this. As health officer of Fairfax County, I have no jurisdiction in treatment plants. We have no jurisdiction over standards, operations, or anything else.

Representative HYDE. Who has that jurisdiction in Virginia?

Dr. KENNEDY. Jurisdiction is reserved by the division of sanitary engineering in the State department of health central office and they, of course, work with the others—they are advisers to the State water control board which has the legal and policing powers so that on a local level, the health officer has no jurisdiction.

In the State of Virginia, I think there are, between public water supplies and public sewage-treatment plants, roughly 600 plants. They have told us that if they can get around to these plants once every 3 months, that would be about the maximum with the number of prospects they have. I feel that in this area if we can have an interstate agency of some sort that this commission could be delegated powers—and I realize that States guard their police powers jealously—from the point of view of technical advice and service to the communities in the area, we would be in a much better position. I can think of one thing in particular in which we are sadly deficient, and that is, ability to get laboratory service.

If something should go wrong in a plant, you don't go out and exercise police powers or give orders, but you seek to give them help, and I think the interstate commission, if it were strengthened would fulfill both these needs.

Representative HYDE. Thank you, Doctor. Any further questions?

Mr. LEVIN. Might I ask a further question regarding laboratory facilities. The display here on my right shows the 16 separate water systems supplying a portion of Fairfax County covered by the various patch areas. How many of these 16 facilities have laboratory facilities and routinely analyze water supply samples from their systems?

Dr. KENNEDY. Well, again, as I have no jurisdiction, I can't answer that, but I would say that to the best of my belief, Alexandria does—Alexandria Water Co. and certainly the Falls Church Water Co. from Dale Carlyle, and it would be analyzed there.

The towns, I doubt have adequate laboratory facilities, if any, and the smaller companies, the Annandale Water Co. has none, nor the Woodlawn Water Co.

I think the two big ones centralized in the district, the ones at Falls Church and Dale Carlyle and Alexandria do.

Mr. LEVIN. Arlington does not examine samples taken from within its distribution service?

Dr. KENNEDY. I cannot speak at all for Arlington, or Alexandria. I have no knowledge whatsoever. I get no reports from Falls Church or from Alexandria. These go to the State central office.

Mr. LEVIN. But yet, portions of Fairfax County are supplied by Falls Church?

Dr. KENNEDY. Yes.

Mr. LEVIN. And there is no sampling program in these areas?

Dr. KENNEDY. No.

Mr. LEVIN. The county health department, then, does not have any laboratory facilities with which to conduct routine water samplings; is that correct?

Dr. KENNEDY. The laboratory serves us for routine health department purposes.

The health department in Arlington, which is the Northern Virginia Laboratory, is supported by State funds.

Mr. LEVIN. And you said normally the State health department visited the sewage treatment plants about once every 3 months?

Dr. KENNEDY. Yes; this is their own admission to us.

Mr. LEVIN. Would the same schedule apply to the water-supply systems?

Dr. KENNEDY. Yes, sir.

I don't know exactly how many inspectors they have, but they have 600 facilities to superintend, all scattered over the whole of the State of Virginia with a limited number of inspectors, less than half a dozen.

Mr. LEVIN. Then, would you conclude that the sampling and bacteriological testing of the water supplies in Fairfax County is inadequate at the present time to fully protect the public health?

Dr. KENNEDY. I can only speak of the smaller water companies like Fenwick Park and others in the neighborhood, maybe 300 homes depending on wells, and they have to take the samples themselves, send them to Richmond, and we would get copies of those.

The bigger ones we don't know about, because, presumably, they are under the control of the State.

Mr. LEVIN. You think this health policing of the water supply to the entire area would be increased by the creation and operation of a sanitary district?

Dr. KENNEDY. I don't like to think of it as "policing."

Mr. LEVIN. Well, perhaps I used the wrong word—"monitoring."

Dr. KENNEDY. What these people want is advice and help, and by the establishment of a capable sanitary district and capable sanitary engineers in a district big enough to support them, this help would be forthcoming.

Mr. LEVIN. Thank you.

I have no further questions.

Representative HYDE. Doctor, the committee appreciates very much your coming here today and giving us the benefit of your views which I think are most important, as I said yesterday; because I think this water-sewage problem is primarily a health problem; and, from the point of view of health officers, it is very valuable.

I want to say that I recognize the jealous guarding of the States of their police powers, and I appreciate it, and am in sympathy with it. It is a very important element in the freedom we enjoy in this country. It does not prevail in other countries, and, as I say, it is an important element of our freedom. But, as our Founding Fathers discovered 170 years ago, there are certain areas in which we must act on a unified and cooperative basis; and there are certain problems which do not lend themselves to State and county lines.

It seems to me that this matter of water and its usage and its disposition is one of them. Water doesn't stop just because of the Mason-Dixon Line or because of any other surveyor's line or report. It continues to flow on natural lines, and, therefore, I strongly feel that more serious consideration to the regional approach of the problem should be given by the jurisdictions, and I think they will discover that if it is handled on a cooperative basis—that is, on an interstate basis, where the States themselves are represented, where they appoint the member, when they appoint the members of such a commission, that they are not giving up any powers or rights.

On the contrary, they are strengthening their own administrative methods of dealing with them and handling them.

So, with that, Doctor, let me thank you very much.

If there is anything further, why, we would be glad to hear you.

Dr. KENNEDY. No, I think I have said enough. It may get me into trouble as it is.

Representative HYDE. Senator Beall.

Senator BEALL. Mr. Chairman, may I suggest, because he is working on a committee—may I suggest that you call Mr. Straus?

Mr. Straus is a member of the staff on the Committee of the Interior of the Senate, and I would like to have his testimony, because I have to go myself in a few minutes.

Representative HYDE. Thank you for the suggestion, Senator.

Mr. Straus.

STATEMENT OF MICHAEL STRAUS, STAFF MEMBER, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, UNITED STATES SENATE

Mr. STRAUS. Mr. Chairman, my name is Michael Straus, a resident, by choice, of the District of Columbia, 2714 Quebec Street NW., and appearing here as such, today, at the telephone request of Senator Beall last night, which I promptly responded to.

I don't know what Senator Beall has in mind, but any contribution I could make to this committee might be in the realm of my considerable experience in river problems.

For many years, as Assistant Secretary of the Interior, and United States Reclamation Service Commissioner, I was required to operate in 17 Western States, and am familiar with the Potomac problems because of study for a quarter of a century.

I would like to proceed as the committee desires, either with questions or, if desired, I could start off with a very brief expression of views, which I would like to restrict only to the river problems before the very broad scope of this committee, because I think those are the only ones I can make a worthwhile contribution to.

Representative HYDE. We will be very glad to have them, Mr. Straus.

Will you make those observations?

Mr. STRAUS. I have no written statement.

The Potomac and what to do with it, of course, has been a matter of concern to me as a citizen, and sometimes as an official, for a quarter of a century.

To add perspective to this, might I add that I think the Army Corps of Engineers is very definitely on the track, and I hope they reach a conclusion.

My belief, from pretty wide observation, is that this area can afford nothing less than full development of the potential resources of the Potomac River, and I attended the hearings of the prior Army Corps of Engineers Board—that was about 10 years ago.

Senator BEALL. 1946.

Mr. STRAUS. 1946.

I thought that this did qualify as a full and comprehensive development of that section of the Potomac and I don't know what the new report is going to show.

It seems to me that our problem here in this phase, the committee's problem, is not only the best way, but how to get ahead with this program of full development.

I should say that in all the western areas for which I have had a responsibility in river programs in recent years with the Bureau, the people of those areas—and I should say, also, the Congress of the United States—has made, and I think very wisely, the determination that there shall be full potential development.

We shall not start out on anything that will foreclose on that.

I do think it is needed very much on the Potomac.

I might add that I did a little homework last night, Mr. Chairman, and read your committee staff's water supply report by Mr. Gilbert Levin, and, as an expert producer of a vast quantity of that particular type of literature, I was very impressed with that report, as it is an excellent one.

Representative HYDE. We thank you, Mr. Straus, and I'm sure Mr. Levin does.

Mr. STRAUS. In the full development—I mean all the possible resource benefits we can get from that river—naturally, I think the most acute problem—and I would, because I have been sort of a waterboy or Gunga Din for 17 Western States—is the water supply problem for Washington.

I think that the end of the water supply from the Potomac, which is our only source of supply, is definitely in sight.

I have found out what happens when people run out of water, and it is very violent.

In the East, we have no realization of what happens when people run out of water.

Representative HYDE. You will admit a little different problem exists in the East than what you have in the West?

Mr. STRAUS. Yes, we do have a little different problem. We are much more fortunate here; but, still, we are approaching the situation here, where we are going to run out of water unless we do some of the things we can very well do to insure our water supply.

Representative HYDE. Wouldn't you say it is very much within the realm of possibility that the method of dealing with the problem inasmuch as there is a difference in the East, might be considerably different than the method of dealing with it in the West?

Mr. STRAUS. Certainly there are many different methods for dealing with it, and they are difficult. However, the basic problem, sir, as far as my experience goes—when you get beyond the capacity of a river—getting more water out of it at a time when you need it, you store some, at least that storage and low water flow are at the time of greatest need.

Representative HYDE. An important question, however, is when and where.

Mr. STRAUS. Oh, yes, there are 57 varieties of how and where and I have never found a river valley yet where that didn't become highly controversial, but I wish to appear as an advocate of the full potential development of say, not only River Bend Dam, but eventually all the storage possibilities that are economic in the opinion of a competent corps like the Army engineers, because I am quite convinced that we will need within a reasonable time all that storage.

At the present time, as a matter of general prospective here and in the rest of the country, we are in a double ratchet. It is really clamping down on the water. We are about doubling the per capita use of water on a national basis, ratchet No. 1. Ratchet No. 2, the per capitas are skyrocketing at the same time. So that gives you a sort of arithmetical progression which makes our problem that is before this committee now.

I would like also to say, because it has been brought before this committee, that the experience of the Bureau of Reclamation is that full resource development always has to come down to the greatest good for the greatest number, because there is a certain amount of competition of what particular benefits you are going to get out of a river, and the wisdom of the Congress generally decides that, and in my experience there is no other competent agency anywhere that has jurisdiction over the rules to make that final decision—maybe not by this new committee here, but by some committee of Congress in the end. They write the ground rules for all this kind of development, and I don't know anybody else who possibly can or should, and that is the western experience.

So I don't pay much attention to suggestions that the problem be finally solved by any other agency.

On a full development, the experience of the Bureau of Reclamation under congressional instruction, of course, is that power is not only a great benefit for a great many people of the area, but also is an invaluable financial contribution in meeting the cost of these developments.

I observe from time to time in the press disparagement of the power possibilities of the Potomac. Such statements as "Well, there is not a lot of power there."

Well, there is not a lot of power there compared with the Columbia River, and I participated in the development of the Columbia River. There certainly isn't a lot of power here. I think there may be 700,000 kilowatts in the full Potomac development, that is nothing compared with the Columbia, but that is nothing against the Potomac, either. It happens that the Potomac may not have the power of the Columbia, but it is a pretty fine river, and incidentally, it is the only one we have and that automatically makes it the best.

The costs of such power are described as high. Well they are high, compared again with the Hoover Dam or Grand Coulee Dam.

However, that is a lot cheaper than any other power I know of that is available in the area, and if we are to have this full development which I hope we do have, and if we are to have water stored in a sizable dam and falling waters released from it, according to the general laws, the Congress has written, for the western developments and other developments too, it seems rather stupid not to avail ourselves of such falling water even for the amount of power that is available in that river which is no small flashlight battery size power. It is considerable.

Of course, the rules for such power are written by the Congress and generally there is a preference to public body which causes a continuous controversy, but that is the way the Congress says it should be handled. I believe in it myself and I assume that will be the outcome of any power development in the river, and beyond that, if we get the greatest good for the greatest number, you do a lot of good for a great many people. If we make that available, they may not otherwise fully participate in the development of the Potomac River. They would also pay big hunk for it in the form of power, and of course, the problem is how to do it economically and collect the money for them.

So on the basis of what experience I have, I would certainly endorse that. Now, I think there are many other factors. Just to add to the perspective of this type of development, which you are now considering as only incident to the broad problems before this committee, and this is going ahead throughout the world, I have participated in it on the Missouri, the Colorado, the Rio Grande, the Sacramento, the Columbia, and many places in the 17 Western States where the reclamation service operates.

I have also observed it and studied it in other places. It is because of our fortunate position here, of not having to go ahead as fast as these other areas have to. However, we are not doing so good on a relative basis.

We are rather inclined to think that we lead the world in power development. My answer is not totally on kilowatts available. It is on per capita consumption.

On a per capita basis, which is a better yardstick measuring it, we have already fallen down nationally to third place among the community of nations on a per capita consumption.

Norway is the highest, at the cheapest rates. Second is Canada. Third is the United States—about to be bypassed on relative speeds of developments now by Sweden and Switzerland, and the Soviets are slipping up and driving a full development program on all their rivers, the like of which we have never seen in this world before.

There was a Senate hearing on that recently when that was developed before Chairman Bible's Committee on Interior and Insular Affairs.

That is generally the prospective view I would like to lay before this committee.

The various other problems I think you have much better witnesses, more experienced witnesses than myself.

Just to close my voluntary statement with an optimistic note, broadly speaking, it is perfectly true that we have a stinking cesspool down here in the center of Washington. We made it that way. The

Potomac and all the other things that you hear so much about in this committee might be true, and can't be remedied, but I hope they are, and there has been in certain ways an outstanding job particularly in the water supply, done on the Potomac.

Representative HYDE. Outstanding job done where?

Mr. STRAUS. On water supply on the Potomac.

It must have been 108 years ago that the Army Corps of Engineers, under direction of Congress, which rejected certain lesser developments, had the vision to reach out to Great Falls and put in a facility that I think provided some 50 times the water needs of that day.

I know in the United States, as a waterboy, I know of no other area which proceeded with such vision under congressional direction.

Now, after a slight pause for station identification—after 108 years—we have reached the end of our supply unless we have further development of the Potomac. That should be, and is rarely recognized, as the outstanding job it is. However, this is the second time around and we have to make another major provision for the river because we are running out of that uncontrolled supply there, and being an eternal optimist, I am quite convinced that these agencies and this committee and the Congress will make another such a wise solution as they did then.

I must emphasize we must not lose sight of the fact that a great job was done that time, and it can be done again.

I could go on and on, but perhaps you would prefer some questions.

Senator BEALL. I am glad to hear Mr. Straus state what the engineers did in 1946. Certainly they did a lovely job and of course we still have that survey available for future use but it wasn't very well accepted if you will remember then.

Mr. STRAUS. I remember how it wasn't well accepted.

Senator BEALL. Most unfortunately the position taken, the criticism was leveled at the Army engineers at that time, because we do know what a splendid job they have done, we also know what a splendid job the district engineers are doing now with the survey, and if you can show us how we can get $500,000 for Colonel Sumner and his staff, why, I think they could come up with a really fine job on the Potomac.

Mr. STRAUS. I would like to be on record as always believing it's a very good investment by the public and the Congress in making the study; the study that is always needed in the end, and I think you get 99 cents out of your dollar in that type of investment.

I would like to say one other thing, Senator Beall, and that is I don't join in any feeling that the control point of getting started on the full development of the Potomac which seems essential, is study funds. I don't say that this river has been studied to death, but I do know some rivers that have been studied to death and you can always continue your studies. I think they are worthwhile studies.

I might point out in broad perspective of that basic data, study data, that only now, for example, they had a 2,000-year streamflow record and that is a very important thing in river development, and many people looked aghast when we built Grand Coulee or Boulder with some 20 years of streamflow record.

There is a point, without stopping study, when we had to consider, for the benefit of the people, stepping out and doing something

beyond study in that. You have to balance those two facts, and in the West we have stepped out and done something on many, many streams with much less study than the Potomac has ever received.

Senator BEALL. I would like to say that we do know, particularly in the Senate, the Committee on the Interior, that we appreciate your coming over, Mr. Straus.

Representative HYDE. Any questions?

Mr. GUTHEIM. Mr. Straus, I wonder if I might put two general questions to you in view of your rather general remarks earlier.

I hope you will be able to answer in the same general spirit.

Earlier, and I think possibly while you were still in the room, Colonel Sumner and Mr. Burrell were asked about the scope of the Potomac Basin survey to which Senator Beall has referred, and their replies indicated that in its breadth and scope this was a major development of earlier and narrower surveys that the corps had conducted; and they felt that one of the contributing factors to the unique character of the survey was the metropolitan growth; that the unusual growth taking place in the area and, possibly, in addition the increasing demand which had been brought about by modern living, industry, and so forth, are making a cut in our limited water resources.

In your comments on the development of the basin as a whole, how would you estimate the emergence of these relatively new urban requirements for water?

Mr. STRAUS. Well, they will increase rather alarmingly in my experience. You probably don't want to pin it only to urban, but to all requirements.

Let me take the urban first:

It will increase alarmingly, because of the increased population; the great increase per capita of those who depend on that stream for water supply, plus the great individual or per capita use. And I think in the figures I have studied, why, that comes out to more than doubling with the decade—water used—because water use, in the end, comes down always to water availability, and when it is not available, they don't use it.

Mr. GUTHEIM. As distinguished from the streams of the arid West, where typically urbanization has not yet reached the proportions it has here in the East, would you say that here there is a greater conflict in the demands for water on the part of various users because of our more intensive development of the country?

Mr. STRAUS. There is a greater conflict, as you say, for types of use, because, out there, in most areas, for example, you either have irrigated agriculture or no agriculture at all.

I don't know quite—I can't agree on the difference in development. You will have to remember that one of the places that reclamation—and I am a waterboy for Los Angeles—and that situation is very acute—it is urbanized and industrialized; but it is great here, and there is the additional conflict in the West.

However, I want to point out another thing, Mr. Director, and that is irrigation use of water is multiplying in the East.

At the time the Reclamation Act was passed, it was done by Congress basically on the philosophy that they made a legislative finding that 17 Western States were arid, and the rest of the country had

plenty of water, which might have been justified as of that time, but nowadays, in New Jersey, Connecticut, and in some sections of the Potomac, the use of water for irrigation is increasing much faster than it is in the 17 Western States, and I anticipate—because of the recent start of that use and the very rapid growth of it, that it is going to continue to do so.

Mr. GUTHEIM. It has been suggested to the committee, Mr. Straus, that these increasing demands upon a relatively stable supply of water and the conflicts to which I refer, require both greater measures of organization and a broader jurisdiction of the water than any that has so far existed.

Do you have any comment on the political consequence of this?

Mr. STRAUS. Without getting into that broad question of jurisdiction, the experience shows that when the needs for water skyrocket, the communities go to larger, local units, usually States, for control of water, and now they are feeling around very diligently and with only moderate success for even wider jurisdictions than the States.

Of course, before this committee is the question of authorities. I assume it is Federal authorities. There are also interstate authorities, compact commissions, and a dozen other ways.

Representative HYDE. No, don't make that assumption at this time, Mr. Straus.

Mr. STRAUS. I don't want to give you an assumption, Mr. Congressman.

I would like to add, however, that in my experience—in pointing out that there is only one authority in this country and various proposals are quite far, far away from the Potomac River, and they have never come to fruition in the last 20 years.

I don't foresee any of those for various, obvious political reasons. Our experience has been that there isn't a great popular interest in that, because the popular interest is for development in communities, and communities are likely to be bored by this question of what is the vehicle—the vehicle of development.

Mr. GUTHEIM. Perhaps, Mr. Straus, in view of your earlier references to the international aspects, I could read one accompanying paragraph from a United Nations report, entitled, "Integrated River Basin Development," that has just been published in the last few weeks.

The paragraph says, under the heading of Cooperative Action in Developing an International River Basin—

> Though advances in science and technology have promoted integrated reservoir systems and many other improvements by the means of water control, they have, ironically, contributed their quota to the desire for isolation and independent action. Possibilities for storage and diversion of water are today far, far wider than they were 50 years ago. A large price may be paid for a scheme which gives independent control of some water resource, though such control might be quite unnecessary in an atmosphere of true cooperation.

Mr. STRAUS. I also read that report in detail, Mr. Director, and I didn't get a great deal of comfort out of it.

Representative HYDE. Thank you very much, Mr. Straus. We appreciate the benefit of your testimony.

May I inquire at this time if Dr. McGough from Alexandria is in the room?

(No response.)

Representative HYDE. Apparently he is not.

Mr. Auld.

STATEMENT OF DAVID V. AULD, DIRECTOR, DEPARTMENT OF SANITARY ENGINEERING, DISTRICT OF COLUMBIA, AND INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

Mr. AULD. Mr. Chairman, I have a map with me——

Representative HYDE. I believe you were going to give us some additional information, Mr. Auld.

Mr. AULD. That is right, sir. It is in the form of a letter.

(The letter is as follows:)

GOVERNMENT OF THE DISTRICT OF COLUMBIA,
DEPARTMENT OF SANITARY ENGINEERING,
April 24, 1958.

Hon. DEWITT S. HYDE,
Vice Chairman, Joint Committee on Washington Metropolitan Problems, House of Representatives, Washington, D. C.

DEAR MR. HYDE: The following comments are made in response to your request during the hearing of the Joint Committee on Washington Metropolitan Problems on April 22, 1958. These are answers to questions on pages 24 and 25 of the staff report on sewage disposal and water pollution. The questions are repeated below and the respective comments immediately follow each.

(1) Should the sanitary facilities of the Washington metropolitan area be consolidated either administratively, or physically; or both?

There would appear to be no need for administrative consolidation of the sanitary facilities of the Washington metropolitan area. Neither need there be complete physical nor operational consolidation. It must be recognized that there are now in successful operation major piping networks in the District of Columbia and in the Washington Suburban Sanitary District which in their present form are capable of satisfactory operation at minimum cost to the citizens served thereby.

Inasmuch as it is cheaper on a per capita basis to build and operate large water filtration and sewage treatment plants than small ones, the area as a whole should put its dependence on the ultimate use of the fewest number of large plants economically and geographically best suited to the service they are to perform. Specifically, the District of Columbia sewage-treatment plant at Blue Plains is able to treat the sewage not only of the District but from the Sanitary District in Maryland and if suitable transportation can be developed, sewage originating in the portions of upper Fairfax and Montgomery Counties tributary to the Potomac can also be most economically treated at this location.

(2) What must be done to control the deposition of silt in the area?

For silt control, there should be the fullest use of all known conservation practices throughout the lands of the Potomac Valley. It must be recognized, however, that since most of these are in private ownership any wholesale conservation program can be achieved only by voluntary cooperation and not by force. Even with the full utilization of these methods, there would be still a sufficient silt problem to justify further control by impoundments at strategic locations.

(3) What actions are required to protect the Washington water supply from pollution from future upstream development?

There must first of all be a land-use plan acceptable to all upriver jurisdictions which will thereby fix the quantity and quality of waste to be generated in the areas tributary to the Potomac. There should then be developed a major tunk sewer line along the Potomac to receive all sewage generated in the upper region. This could discharge to the District's sewerage system for the ultimate disposal of wastes at the Blue Plains treatment plant. There should then follow a policy by local communities and State enforcement agencies under which new local sewage-treatment plants upstream of the water intakes would be discouraged or prohibited and existing plants progressively abandoned.

(4) How can sewer service be provided to allow and promote the orderly and pollution-free development of the downstream section of the area?

During the period of initial development, it is probable that downstream communities must first be served by small sewage-treatment plants. After development of sufficient population to support the necessary works, these plants should be abandoned and the flows from their several tributary sewage systems be collected and delivered to at least one major downriver plant on each side of the Potomac. Conceivably, the effluents from these plants, together with those from existing larger plants upstream, must in large part be transported to points more and more remote from the city where larger quantities of dilution water will be available.

(5) What is the natural capacity of the Potomac to assimilate pollution?

The only existing record of the Potomac's assimulative capacity is the result of 20 years of regular sampling performed by the District of Columbia. This provides a valuable historical record of the rivers' behavior under increasingly heavy pollutional loading. Unfortunately, factors other than those revealed by conventional sampling as in the past have a bearing on the river's assimulative capacity and much more informaation must be secured before firm answers are possible. This subject should be the basis of extensive future work.

(6) What shall be the ultimate disposal of the treated sewage effluent from the metropolitan area?

As pointed out in responses to question (4) above, high-grade effluents from the metropolitan area probably must be transported into areas where greater dilution is possible. It is to be hoped, of course, that additional treatment techniques may obviate this expensive procedure. Possibly the demineralization of effluent so as to remove its nutritive properties may sometime become economically feasible.

(7) Can the cost of separation of the combined sewers in the District of Columbia be reduced to the point where total separation is ultimately feasible?

The money cost of sewer system separation in the District of Columbia is perhaps less of a deterrent than the physical difficulties of separating the plumbing on private property which provides such inconvenience to the public. It is believed that all new construction and all major renovation of old properties should provide dual connections from individual buildings. This would provide a long-range approach to ultimate total separation. It will be my policy to facilitate separation in every way possible. There does not appear to be any shortcut by which the tremendous magnitude of the work performed can be reduced.

(8) Shall the metropolitan portion of the Potomac River above 14th Street be converted into a recreational basin suitable for swimming, fishing, and boating?

Under the proposals of our Board of Engineers for project C, the river water quality down to Key Bridge should be suitable for swimming and other forms of recreation. I have personal doubts as to the need to extend this zone of swimming water as far as the 14th Street Bridge. I cannot be certain that the establishment of a large bathing beach in the Potomac Park area would be consistent with the general character of that particular locality.

(9) For what period into the future should plans and construction be undertaken?

Local sewers should be sized for ultimate requirements and major trunk sewers connecting to disposal plants should be adequate for requirements expected in the year 2000 or later. Similarly, basic sewage-treatment sites, if for permanent plants, should be sized large enough to permit plant expansion for year 2000 needs. Stage construction of the various plant units should provide for growth, say, within 10 to 15 years of their completion dates.

(10) What is the best means for financing the necessary organization, administration, engineering, and construction to attain the desired goals?

Insofar as the District of Columbia is concerned, as pointed out in my statement to the committee, our foreseeable resources are not sufficient to permit completion of our project C trunk and interceptor system by the time needed. Acceleration of construction would appear possible only if Federal aid could be provided. It is believed that the Federal impact is such that a case for such assistance can be readily made. If the project C trunk sewers and existing Blue Plains plant are used by the other tributary jurisdictions, they would become the nucleus of a metropolitan disposal system. Federal aid for at least the major

trunk extension along the river upstream of the District would also appear appropriate. With the availability of such a sewer, operated by the authorities having responsibility in the area through which it passes, it should be possible for the local jurisdictions to finance the necessary lateral lines and systems which would discharge to it.

Sincerely yours,

DAVID V. AULD,
Director of Sanitary Engineering.

Mr. AULD. I have a map with me, also, and I would like to show it. We find in green here [indicating]—these are aerial photographs with just portions colored—and the red in each case is the surface from which rainwater will run. The green will absorb it to some extent. At least, it has no improvements on it.

I think the one on your right [indicating] shows the stream problem level we have in the central city, since that is typical in any effort to separate the domestic sewage from the storm runoff, when you consider that all the existing piping for that now is scrambled into one system.

In further support of that, I should like to present for the record some analyses made by our Board of Engineers.

Representative HYDE. It will be received in the record.

(The document referred to is as follows:)

TABLE 8.—*Impervious area in typical blocks*

Area No.	Block bounded by—	Description	Total area, to center of streets, square feet	Area of impervious surfaces, square feet	Percentage of impervious surface
1	Colorado Ave., 17th St., Blagden Ave. NW., and 16th St.	Individual, large houses widely spaced, with big lawns, high class.	571,800	201,800	35.3
2	Emerson, 13th, Farragut, and 14th Sts. NW.	Individual houses, on fairly large lots, houses large and old.	410,400	160,100	39.0 (43.5)
3	Holly St., Alaska Ave., Geranium St., and 14th St. NW.	Individual houses, medium to high class, with good size lawns, etc.	250,900	102,600	40.9 (43.0)
4	Benton Pl., Rock Dr., Massachusetts Ave., and 30th St. NW.	Individual houses, fairly high class, fairly large lawns, individual driveways, no public alley.	176,500	77,500	43.9
5	Kennedy, 16th, Longfellow, and 14th Sts. NW.	Individual large houses, high class, built fairly close, fair size lawns.	332,300	147,300	45.9
6	Farragut, 7th, Gallatin, and 5th Sts. NW.	Row houses, higher type, fairly deep back yards.	269,100	172,900	64.2 (57.0)
7	Sheridan, 5th, Rittenhouse, and 7th Sts. NW.	Duplex houses, spaced fairly well, nice but small lawns.	312,200	201,400	64.5 (57.5)
8	Crescent Pl., 17th St., Kalorama Rd., and 16th St. NW.	Large apartment buildings, high class, with small portion of row houses.	332,800	223,400	67.1
9	Crittenden, 4th, Buchanan, and 5th Sts. NW.	Row houses, average to good type, built fairly close.	230,100	167,200	72.7
10	16th, T, 15th, and U Sts. NW.	Row houses, low quality, built very close together.	273,800	204,500	74.7
11	19th, S, 20th, and R Sts. NW.	Small apartment buildings, built very close.	221,400	165,400	74.2

NOTE.—1. Areas No. 1 to 5, inclusive, are not fully developed at present, but allowance has been made, in the data shown, for assumed future "complete" development.

2. Areas No. 6 to 11, inclusive, are considered to be fully developed at present.

3. Values of percentage of impervious area shown in parentheses for certain areas (last column) are corresponding values shown in appendix B of Report on Measures for Elimination of Pollution of Rock Creek and Its Tributaries in Washington, by LeRoy K. Sherman and Wesley W. Horner, dated Aug. 1, 1935. The same blocks are represented, except in the case of area No. 7, where the data represent adjacent blocks which are considered to be almost identical in development.

Mr. AULD. This shows typical situations from some 35 percent up to as much as 74 percent.

Mr. Levin, in his staff report, alluded to the desirability of separation and the possibility that by the expenditure of some $70 million in addition to some sums elsewhere discussed in his report, that we would then have a system of sanitary sewers suitable for separation.

I got the impression, then, from his writing, that that could be used, perhaps, for domestic sewage perhaps and roof drainage.

We have considered that a little bit and are unable to agree with his conclusion.

The roof drainage in the aggregate, from the combined system of the District, we think would amount to about 5,000 acres and would result in a discharge of about 90,000 cubic feet a second. While the domestic flow is at the same time from the same area, it would be something less than 250 cubic feet per second. Not dealing in dollars, but in generalities, I fear that the approach suggested would involve as much as, or more cost to achieve pollution abatement than the full separation suggested by our Board of Engineers project A.

Was there anything further, Mr. Levin, that you had—that you wish to have developed?

Representative HYDE. Mr. Levin, did you have anything?

Mr. LEVIN. It might be worthwhile pointing out that the cost mentioned, that is, the total cost cited by the report for the complete separation, was $213,445,000. However, of that total, the amount required for the sewers themselves is $74,018,000.

Mr. AULD. That is right.

Mr. LEVIN. The remaining $139,427,000 is for the construction that would be necessary in separating the house connections, the private plumbing, work that would be necessary.

Mr. AULD. That is right.

Mr. LEVIN. Do you foresee any possibility of financing the much larger sum that is required for house connections, separation, other than by means of the District of Columbia government as an expense of the separation?

Mr. AULD. I do not. I feel that the cost of separating private existing plumbing should be municipal.

I feel that any requirements that the individual owners submit to those expenses will seriously dislocate the local economy. It will, in the combined areas, make a great differential in the sale of property and its value and I think depress it materially.

Mr. LEVIN. In the report you mentioned there was a considerable breakdown in the cost factors involved in the complete separation of the sewage system.

Mr. AULD. Yes.

Mr. LEVIN. There was no such breakdown of the cost involved from modified separation, although there was a short general discussion of this which indicated that the Board of Engineers do not feel that this method was feasible.

Do you believe that it might be to our advantage to know with more detail the cost involved in the modified plan at this time?

Mr. AULD. I do not think the great effort of a detailed survey would be justified in making that decision. We think our first step must be to construct interceptors and to move into certain separations which are obviously necessary.

There would be plenty of time after that, or during that, for further exploration of this point. I might say that in the construction of relief sewers for storm overflows, in the central city, I intend to use that construction as an opportunity to develop a split system of a sort, and take in those where possible, nothing but surface runoff. To the extent that we succeed in that we will relieve the interceptors from the combined sewers and there will be some small benefit.

Mr. LEVIN. You have stated that because this is the Federal City it is necessary to provide greater dilution in the lead sewers in the forthcoming plan than would normally be used in other municipalities and you spoke, indeed, of some dilution factors as great as 30, I believe.

Mr. AULD. Yes.

Mr. LEVIN. What will be the effect of these increased capacities upon the quantity of storm water runoff that will be delivered to the District sewage treatment plant for treatment with the domestic sewage?

Mr. AULD. Well, of course, when the quantity reaches some level above the domestic volume, it will not be treated. It will simply be discharged as an extra to the river below the plant.

Mr. LEVIN. But as much as 30 times the normal domestic flow would be carried by some of these sewers?

Mr. AULD. The 30-dilution portion of the system would be relieved in part before reaching the plants on project C.

Mr. LEVIN. Nonetheless, there would probably be some substantial increase in the quantity of sewage treated at Blue Plains?

Mr. AULD. Oh, yes, we would put through what the plant would take, but we wouldn't pretend to treat storm water in those volumes. In fact, the biological process couldn't stand the shock.

Mr. LEVIN. Have you any estimate at present of how much storm water is treated in the Blue Plains plant?

Mr. AULD. Just about all we can get there, but quantitatively, it is not a whole lot.

Mr. LEVIN. Have any considerations been made in the cost analysis to the credit side of separation of the combined source for the reduction in open operating cost and future sewage treatment plant—sewage plant construction cost which would be possible by the elimination of the storm water from the treatment process?

Mr. AULD. I don't think we have much to work on there. I mean I don't think anyway you are going to figure it, you will get enough to make the credit worth while. We are not attempting to treat that much stormflow in the first place.

Mr. LEVIN. Even with the plan to increase the capacities of the combined sewers by adding these reliefs. This will not relieve discharge of the sewage to the river?

Mr. AULD. No. It is going to go one way or the other. We are removing it from one place and putting it someplace else in the river.

Mr. LEVIN. And that someplace else will still be the river?

Mr. AULD. Yes.

Mr. LEVIN. The only way you can get it, the domestic sewage out of the rivers is by complete separation?

Mr. AULD. No question about it. And that should be our fixed policy, but it may take 100 years.

Mr. LEVIN. I asked you the other day, I think I deferred the question until you returned here, whether you felt that from the point of view of benefits received for dollars expended, the complete separation of the combined sewer area was desirable?

Mr. AULD. On a dollar basis, I doubt it. I assume that the benefit would be translated into some better level of use of the river itself, and I am not sure with the full removal of domestic sewage that your river will even be a big quality—will be of a quality which will permit unlimited recreation, and if you get no added benefits through the removal of it, the cost therefor is questionable.

Mr. LEVIN. Well, then, there is now pending a regulation to the building code which would require the installation of separate interior plumbing systems in all buildings, even though they be in the combined area.

Now, do you believe that this regulation should not be passed in view of the fact that there seems to be no advantage to ultimate separate?

Mr. AULD. No; I think there is some basic matter of river esthetics, and possibly health implications which on that contemplated scheduled separation would justify the expense. I just can't see putting $200 million or $300 million, which nobody has, into a project of this sort.

Representative HYDE. I get from what you said that you see some benefit, but no great urgent benefit in such separation.

Mr. AULD. Precisely. I don't see it as the type of thing you would go into on a stampede, and hope you can stand back and say this river is pure. It won't be.

Mr. LEVIN. You don't think that a 20-year period, or 25-year period, for the separation, if the money were not coming from competitive projects, would be desirable?

Mr. AULD. I didn't say not desirable. You asked me if it would pay.

Representative HYDE. Well, there are many things that are desirable. We would all think it might be desirable to have a Cadillac instead of a 1946 jalopy.

Mr. AULD. That is right.

Representative HYDE. It is a question of what we need to best serve our purposes with the resources that are available; isn't that it?

Mr. AULD. That is my concern.

Mr. GUTHEIM. One question, Mr. Auld. The failure to separate sanitary and storm-water sewers will result certainly in a permanently polluted Potomac on the occasions when raw sewage is admitted to the river.

My impression of the standards that the interstate commission has adopted for various stretches of the river, and which I believe Colonel Welling said have been adopted by the Water Committee of the Washington Metropolitan Conference, and are now being studied by their various member jurisdictions, contemplate full recreational use of the river south of Fort Washington; is that correct?

Mr. AULD. Yes.

Mr. GUTHEIM. But that would not be possible so long as the sanitary sewers were not separated from the storm water system?

Mr. AULD. No.

Mr. GUTHEIM. Thank you.

Mr. AULD. No—wait a minute. Just the contrary. The river, and proceeding from the city to Fort Washington under present conditions recovers to a condition substantially the same as it had when it arrived at Great Falls, and by the act of sewage treatment and by the reductions which we contemplate in our project C work, we confidently believe that as far as the effects of the District of Columbia and the sanitary districts of Maryland are concerned, that we will do nothing to the river to prevent it from full recreational use below Fort Washington, with or without separation.

Mr. GUTHEIM. As to the degree of recovery that might be expected, it would of course depend upon the specific conditions that existed in the river, and the amount of sewage getting into it and things of that kind, but I think under the circumstances these are matters that ought to be considered by health officers.

May I introduce into the record, these documents? That prepared by the Public Health Service bears on the point we are discussing.

Mr. LEVIN. And this document also showing relative cost of treatment plants?

Representative HYDE. They will be introduced into the record.

(The documents referred to are as follows:)

EXHIBIT A

A REVIEW OF INTERSTATE POLLUTION OF THE POTOMAC RIVER IN THE WASHINGTON METROPOLITAN AREA

The Department of Health, Education, and Welfare, Public Health Service, June 1957

Prepared by F. W. Kittrell and W. H. Davis, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, with the advice and assistance of C. H. Atkins and L. W. Gebhard, region III office, Charlottesville, Va.

BACKGROUND

Probably no interstate water pollution problem in the Nation has been the subject of more studies, articles, talks, and reports than has that of the Potomac River in the Washington metropolitan area. The situation has received attention in the Halls of Congress, and by the President of the United States. It has been the subject of lively discussion by residents of the area, in the local press, and on radio and television. It has been noted by countless visitors from the entire Nation and from all over the world.

FIRST COMPREHENSIVE STUDY, 1913–14

In 1913–14 one of the first comprehensive studies of stream pollution in this country was made by the Hygienic Laboratory of the Public Health Service on the Potomac River. At that time the sewered population of the Washington metropolitan area was estimated at about 320,000, and practically no sewage treatment was provided. The main river was found to be in reasonably good condition, and it was concluded "that for many years to come the river will have ample oxygen to care for the sewage from the estimated increased population of the vicinity." An exception to the generally satisfactory situation was the stagnant condition of the Washington Channel-Anacostia River area. Much of the offensiveness of this area was attributed to "the storm water discharge, with its content of horse manure, etc." In the vicinity of the main river outfall odor was very slight and "was greatest when the wind came from the Virginia shore, where a soap factory was located." Nevertheless, it was foreseen that "the capacity of the river to dispose of [raw] sewage without nuisance or danger will eventually be overtaxed" and it was recommended that "primary treatment works should be installed in the near future" by the Dis-

trict of Columbia. One of the reasons advanced was "the example in such matters that should be afforded by the National Capital."

Since that time the Public Health Service, either independently or in cooperation with other interested agencies, has reexamined the pollution of the Potomac River in the Washington metropolitan area on an average of once every 10 years. Since 1937 personnel of the District of Columbia sewage treatment plant have maintained a routine river sampling program which has produced an invaluable record of stream conditions.

Although several sewage treatment plants have been provided, the relentless increase in sewered population of the area thus far has outdistanced the improvements that have been made. The history of water quality of the river in the vicinity of Washington has been one of continuing degradation. The National Capital has not yet "set the example in such matters" so hopefully proposed in the 1913 report.

BACTERIOLOGICAL STUDY, 1925

In July and August 1925, the Public Health Service made its second investigation of the pollution of the Potomac River in the vicinity of Washington. The primary purpose of the survey was to determine "whether the use of the river for bathing would expose the bathers to the danger of contracting sewage-borne diseases." Samples were collected from July 7 to July 31. Laboratory determinations were restricted to bacteriological examinations. The report stated that B. coli contamination in 1925 was greater than it had been in September 1913, "as a result of growth of the District and the extension of domestic sewers." It concluded that no section of the river adjacent to the District of Columbia "could be considered free enough from pollution with sewage to permit its use for bathing without a potential danger to such bathers of contracting sewage-borne diseases." The report also noted the problem of storm water discharges and of heavy pollution in the Anacostia River. It recognized the difficulty of obtaining cooperation among the several communities for abatement of pollution, in the absence of adequate pollution control laws, but suggested that much could be accomplished in reduction of pollution by extension of main intercepting sewers of the District of Columbia and by either primary treatment of District sewage or extension downstream of the main outfall sewer.

STUDY OF DISPOSAL OF SEWAGE IN THE POTOMAC, 1932

The Public Health Service was directed by a Senate resolution in 1932 to investigate conditions resulting from the existing method of disposing of sewage from the District of Columbia in the Potomac River. The purposes were to determine whether the disposal constituted a menace to public health and an annoyance to residents, and destroyed or rendered oysters unfit for human consumption, and to determine the estimated cost of a more suitable method of disposal. By this time the estimated sewered population of the Washington metropolitan area had increased to 575,000, or an increase of 80 percent since 1913. The river was sampled from July 25 through September 14. The effects of pollution had increased markedly since the 1913–14 survey. The bacterial contamination was judged to render the river unsuitable for bathing from Three Sisters Island to Fort Washington. "At the sewer outlets (dissolved oxygen) saturation was 42 percent in 1932 as compared to 61 percent in 1913." On some days in 1932 the "dissolved oxygen was depleted at the sewer outlets and approached depletion at Giesboro Point and in the lower Anacostia River." There was "an area between Giesboro Point and Fort Foote in which the average oxygen saturation was below 50 percent." The dissolved oxygen was so reduced that "fish life can no longer be supported within this area." In anticipation of the normal increase in sewage load in the future it was predicted that "conditions near the sewer outlets may actually be productive of nuisances." For the first time the situation was described as critical. The report concluded that the District of Columbia should take steps to provide treatment "if it should be desirable to prevent the development of nuisances and make the river suitable for bathing and other recreational purposes and capable of supporting fish life during the summer." Primary treatment was considered adequate for the immediate future, but it was suggested that the plant design incorporate provisions for subsequent addition of secondary treatment.

In 1937, the District of Columbia completed a primary sewage-treatment plant and placed it in operation. Treatment plants were completed by several Maryland and Virginia communities in the Washington metropolitan area during the thirties.

LOW STREAMFLOW AUGMENTATION STUDY, 1944

In 1944, the Public Health Service completed a report for the Corps of Engineers on estimated benefits to water supply and waste disposal in the Potomac River Basin that would result from low streamflow augmentation through a series of impoundments proposed by the corps. Conclusions regarding sewage disposal in the Washington area were based principally on results of river sampling by the District of Columbia sewage-treatment plant personnel from 1937 through 1943. Sewered population in the Washington area had doubled since 1932, and stood at an estimated 1,149,000 in 1943. This was an increase of 250 percent since 1913. Sewage treatment in the District of Columbia, the Washington Suburban Sanitary District (Maryland), and Arlington County, Va., reduced the sewage discharged to the river in the area in 1943 to an estimated population equivalent of 781,000. Thus, in spite of many millions of dollars spent for sewage treatment, the river was receiving a 36-percent greater load of sewage in 1943 than it had in 1932.

The increased sewage load was reflected in decreased dissolved oxygen content of the river water. The 1944 report noted that a minimum dissolved oxygen of 0.3 parts per million had been found in the tidal estuary opposite Washington, and "that the average of the lowest individual results obtained during the past 6 years is 2.4 parts per million." It concluded that "the present treatment of sewage at Washington, D. C., and vicinity would be considered inadequate, and that secondary treatment through the 6 summer months (May through October) is required to correct objectionable conditions."

INTERSTATE COMMISSION STUDY, 1954

In 1954 the Interstate Commission on the Potomac River Basin published an excellent report on water pollution in the Washington metropolitan area. The Public Health Service, as well as many other agencies, cooperated in the preparation of this report. This publication deals in a comprehensive manner with all facets of the problem, including all sources of wastes, the effects of river-water quality through 1951, present and future water uses, water-quality objectives for various sections of the river, and pollution-control measures needed, with a recommended pollution-control program and estimated costs of needed improvements.

It was estimated that the sewered population of the metropolitan area had increased to 1,540,000 by 1952, a 34-percent increase since 1943. The estimated population equivalent of the sewage discharged to the river had increased to 1,135,000, for an increase of 45 percent since 1943.

The continuing increase in sewage discharged to the river was reflected in continuing reduction in water quality. The interstate commission report succinctly summarizes the condition of the Potomac in the Washington area. The river "approaching the District of Columbia is a reasonably clean stream" but, periodically, is "higher in bacteria than desirable. Pollution mounts rapidly in the Roosevelt Island area and below, resulting from combined sewer overflows, the discharge from the Anacostia River," and sewage from the District of Columbia and the three Virginia jurisdictions across the river. "Dissolved oxygen is practically depleted at times, the most probable number of coliforms ranges as high as 500,000 per 100 milliliters, and unsightly, malodorous conditions result." The "unsightly conditions" included visible evidence of sewage pollution on the District side of the river in the vicinity of 27th and G Streets and the watergate, where overloaded interceptors discharged undetermined quantities of raw sewage. Similar visible evidence of sewage existed in the slack water of Four Mile Run below the outlets of Alexandria and Arlington County sewage. Gas bubbles from sewage sludge deposits rose to the surface over wide expanses of the river. The resulting "malodorous condition" was notably prevalent in the section from Roosevelt Island, opposite the mouth of Rock Creek, to a short distance below the mouth of Four Mile Run.

The foregoing brief history of the losing struggle against pollution of the Potomac River in the Washington metropolitan area is taken from only five reports selected from the mass of available written material on the problem that was reviewed and abstracted. The most recent of the five, that of the Interstate

Commission on the Potomac River Basin, covers the problem so thoroughly that nothing would be gained at this time by adding another lengthy report to the already profuse store of publications. It is necessary only to bring the salient features of the interstate commission report up to date.

Present Conditions

SOURCES OF POLLUTION

Sewage

The Potomac River in the Washington metropolitan area receives sewage from five major areas. These are the District of Columbia, the Washington Suburban Sanitary District (Maryland), Alexandria, Va., and Arlington and Fairfax Counties, Va.

During the week of April 28, 1957, officials responsible for sewage disposal in the 5 areas were interviewed by representatives of the Public Health Service. Through the courteous cooperation of these officials, information was obtained on the current status of sewage disposal. Data on sewered populations were provided. Sewage-treatment plants were visited, and treatment practices were observed. Plant-operation records were reviewed and abstracted for data on sewage loads entering the plants and discharging to the receiving waters. Locations of points of sewage discharge were determined. These included points at which both treated sewage from the plants and untreated sewage from storm-water overflows and from interceptor, pumping-station, and treatment-plant bypasses enter the receiving waters. Available data on quality of the receiving waters were obtained.

Figure I presents the locations of the principal sewage-treatment plants, their points of discharge, and the general areas of raw-sewage discharge from the numerous overflows and bypasses.

Table I summarizes data on population equivalents; types of sewage treatment, raw and treated sewage loads, reductions accomplished by treatment plants, and percentages of the total load of pollution discharged to the receiving waters from the individual sources.

The present total raw-sewage population equivalent is estimated to be 1,678,000, which is a 9-percent increase since the 1952 estimate of the interstate commission. Treatment plants reduced this to an estimated population equivalent of 1,143,000. This population equivalent is based on normal performance of the existing sewage-treatment plants. Actually, during the week of April 28, the District of Columbia Blue Plains plant and the Fairfax County Westgate plant were not operating normally. The abnormal operation permitted an estimated additional population equivalent of 142,000 to be discharged to the river at that time. The population equivalent of 1,143,000 represents 32 percent overall reduction of the raw sewage originating in the Washington metropolitan area.

Figure XVIII shows the increases in sewered population and sewage discharged to receiving waters since 1913.

The population equivalent of the sewage discharged to the receiving waters is about 1 percent greater than it was in 1952. Thus, the overall benefits accruing from installation of sewage-treatment plants by the city of Alexandria and by Arlington and Fairfax Counties during the past 5 years have been negated by the inexorable increase in sewered population of the metropolitan area.

This does not in any way detract from the credit due these Virginia areas for their recent contributions toward solution of the overall problem. Not only have they helped to maintain the status quo with respect to the total treated-sewage load discharged to the receiving waters. They also can, by proper operation of the treatment facilities they have provided, improve their share of those localized areas of visual and olfactory nuisances, caused by raw sewage, which so acutely have called to public attention the serious pollution of the Potomac River.

This does not imply that these Virginia areas, contributing a combined 16 percent of the sewage load from the Washington metropolitan area, have fully solved their sewage-disposal problems. The adequacy or inadequacy of the measures taken to date can be determined only within the framework of a unified plan for pollution abatement by the entire metropolitan area.

The District of Columbia Blue Plains sewage-treatment plant contributes 83 percent of the sewage load discharged to the receiving waters. Of the 1,262,000

sewered population served by the Blue Plains plant, about two-thirds are in the District of Columbia and one-third in the Washington Suburban Sanitary District. With an exceedingly few minor and one major exception, the Blue Plains plant receives all of the sewage from the Washington Suburban Sanitary District. The major exception will be discussed subsequently, in connection with overflows of raw sewage.

The Blue Plains plant serves 75 percent of the sewered population of the Washington metropolitan area, but contributes a disproportionate 83 percent of the total load to the receiving waters. It accomplishes only 25 percent reduction in the biochemical oxygen demand of the raw sewage that it treats, compared to reductions in the range of 35 to 64 percent accomplished by the 3 Virginia jurisdictions.

The sewage discharge from the District of Columbia treatment plant is the major sewage load contributing to interstate pollution of the Potomac River in the Washington metropolitan area.

Most of the dry-weather flow of sewage in the metropolitan area now receives some type of treatment. A discussion of loads discharged by the treatment plants only does not provide a complete picture of the pollution imposed on the Potomac River. There are intermittent discharges of raw sewage that potentially can, or actually do, occur from all of the sewerage systems involved. These discharges are of several types.

1. *Treatment-plant bypasses.*—These are devices, common to most sewage-treatment plants, that permit portions of the raw sewage arriving at the plants to be routed around the treatment facilities and to discharge directly to the receiving streams without treatment. These devices normally are used when excessive quantities of sewage arrive at the plants following rains that introduce large quantities of surface runoff to the collection systems. They are provided to prevent hydraulic overloading of treatment facilities, which would be quite costly if designed to handle the occasional large flows involved.

Treatment-plant bypasses also may be used when it is not feasible to operate the plants in a normal manner. Reasons for such use include breakdowns in plant equipment and shutdowns for plant repair and maintenance. When possible, maintenance activities should be scheduled for periods when flows in receiving streams are high.

2. *Pumping-station bypasses.*—Many severage systems require pumps that lift sewage from sewers deep in the ground to sewers at higher elevations through which the sewage flows by gravity to the treatment plants. Pump capacities sometimes are inadequate to handle the entire flow of sewage following rains. At such times, portions of the raw-sewage flow is allowed to bypass the pumping stations and flow directly to the nearest receiving streams.

3. *Storm-water overflows.*—Many of the older cities in this country initially installed combined sewers to accommodate both domestic sewage and all surface-water runoff from rainfall. During rains, combined sewers carry flows that are many times as great as the normal dry weather flow of domestic sewage alone. Practically all combined sewers are equipped with overflow devices that permit large portions of the storm-water flows, including raw sewage, to pass directly to the nearest stream.

4. *Interceptor overflows.*—Intercepting sewers normally are designed to be adequate for increased sewage flows that will result from reasonably anticipated population growths for many years in the future. In areas where population growths exceed reasonable anticipations, the interceptions may become overloaded before additional interceptor capacity can be installed. When this occurs, overflow devices must be provided, pending installation of relief interceptors, to prevent sewage from backing up into and overflowing from house connections and manholes in streets.

Raw sewage intermittently discharged through bypasses and overflows can cause visual nuisances, due to objectionable floating materials, and olfactory nuisances, due to sludge deposits. These obvious evidences of pollution can cause more adverse public reaction than does a treated-sewage discharge that may cause excessive bacterial contamination and badly depleted dissolved oxygen.

Figure I shows general locations of points on the major sewerage systems of the Washington metropolitan areas where raw-sewage discharges can occur.

The newer Arlington and Fairfax County systems have the usual pumping-station and treatment-plant bypasses. It is reported that they have no combined sewers or overloaded interceptors.

Much of the Alexandria system consists of combined sewers. These have storm-water overflows that discharge directly to the Potomac River along the city's waterfront upstream from the mouth of Hunting Creek.

The main interceptor carrying sewage from the Washington Suburban Sanitary District along the Anacostia River to the District of Columbia Blue Plains plant is overloaded. It frequently discharges raw sewage to the Anacostia River through an overflow at Blaine Street.

About one-half of the District of Columbia system consists of combined sewers. These are served by numerous overflow devices along the Potomac River waterfront from about Three Sisters Island to the Memorial Bridge, along the entire length of Washington Channel, and on the Anacostia River and Rock Creek.

The District of Columbia also has overloaded interceptors. Overflows at the watergate (near Lincoln Memorial) and at 27th and G Streets, in particular, have been cited as points of frequent raw sewage discharge in the past. During the visit to the District of Columbia by Public Health Service personnel during the week of April 28, it was stated that there had been only one dry weather overflow through the 27th and G interceptor overflow since the previous September. Similar improvement in the watergate interceptor overflow also was reported.

Exact data are not presently available on quantities of raw sewage discharged from the various sources described above. It has been estimated that "about 2 percent of the sewage generated in the District [of Columbia] reaches the waters without treatment through the operation of the combined sewers during rains." The District of Columbia has installed continuous flow recorders on its more important sources of raw sewage discharge, and a report on the District's problem is being prepared by a consulting engineer. It is expected that the report will be completed during June of 1957, at which time the first reliable quantitative data on this phase of the situation will be available.

During the week of April 28 about one-third of the raw sewage received at the District of Columbia Blue Plains plant was being bypassed directly to the river without treatment. This was necessitated by work on the sludge digesters. Only one-half of the digesters were in service, and they could handle the sludge from only two-thirds of the raw sewage.

During the visit to the Fairfax County westgate sewage treatment plant the sludge digester was out of service. All solids that settled in the sedimentation basin were being discarded to the river. The result was that this portion of the Fairfax County sewage was, in effect, receiving no treatment at that time.

Industrial wastes

The 1954 report of the Interstate Commission on the Potomac River Basin states that "Industrial wastes are a relatively minor problem in this area, with few exceptions, and can be handled to a large extent by appropriate connections to municipal sewer systems." Several cement and sand and gravel companies discharge a total of 40 to 90 tons per day of inert solids to the river. Surface wash and drainage from several stockpiles of coal cause discoloration in the Potomac and Anacostia. Most other industrial wastes are from a variety of small manufacturing plants located on small tributary streams. While some of these cause local nuisances and complaints they general "have little significance with respect to the general pollution load of the main river."

WATER QUALITY

An invaluable record of water quality in the Potomac River since 1937 has been accumulated by personnel of the District of Columbia Blue Plains sewage treatment plant. A routine river sampling and analysis program has been conducted, without break, since September 22, 1937.

Seven sampling stations (fig. 1) have been used since the beginning. These covered a 15-mile section of the river, from upstream Three Sisters Island to downstream Fort Washington. The Blue Plains treatment plant outlet discharges at the approximate midpoint of this section. Stations upstream as well as downstream from the outlet show effects of the treatment plant effluent. The upstream effects reflect the impact of tidal action in this section of the Potomac. Rising tides cause water to flow upstream past the plant outlet, carrying the treated sewage with it. When the tide falls the water flows downstream, receiving still more pollution as it again passes the outlet. This may be repeated several times during low streamflow periods. It has been stated that water in this section of the river, carrying its load of pollution, moves downstream so slowly during periods of low flow that the Potomac is more like a lagoon or lake than a river.

In recent years, as the effects of increasing pollution extended farther downstream, the sampling network has been extended by the addition, in 1952, of two more stations to cover the river down to Hallowing Point. This is about 15 miles below the Blue Plains outlet. A third station has been added opposite the outlet.

Samples generally have been collected once or twice monthly during the colder periods of the year. In the more critical periods of higher temperatures and lower streamflows, from March through October, samples generally are collected weekly. Sampling trips usually are made on Wednesdays, between 8 a. m. and 1 to 1:30 p. m. Principal sampling points are in the river channel at depths of 5 and 25 feet below the water surface except at Three Sisters and Roosevelt Islands and above the outfall sewer. At the former two, samples are collected at the 25-foot depth only. At the latter, samples are taken at 5 feet only.

Analytical determinations include temperature, dissolved oxygen, 5-day 20° C. biochemical oxygen demand, turbidity, chlorides, bacterial plate counts on agar at 35° C., and most probable numbers of coliform organisms.

Copies of all analytical results through 1956 have kindly been made available by the District of Columbia Department of Sanitary Engineering.

Of the available data, those for coliform organisms and dissolved oxygen have been selected for use in this report as most indicative of the results of sewage poilution of the Potomac River in this area.

Coliform organisms

Arithmetic averages of coliform organisms per milliliter have been computed for May through October of each year. Both monthly and summer (May through October) averages have been obtained. The averages for each sampling station from Three Sisters Island to Fort Washington are shown in figures II through VIII. The averages are expressed in coliforms per milliliter, rather than in the more commonly used coliforms per 100 milliliters. The charts include lines, drawn by eye, showing trends in coliform contamination from 1938 through 1956. They include horizontal lines showing the coliform organism objectives suggested in the 1954 report of the Interstate Commission on the Potomac River Basin. Comparable data, where available from previous Public Health Service reports, are shown for the years of 1913, 1925, and 1932.

Averages of summer values for the last 3 years, 1954–56, are shown for all sampling stations, except the one opposite the outfall, on figure XVI. This chart includes the maximum monthly average that occurred during the three summers for each sampling station.

The trends of coliform contamination at the Three Sisters and Roosevelt Island stations have not been consistent. At Three Sisters Island most averages have exceeded the monthly median objective of 2,000 per 100 milliliters suggested by the Interstate Commission, reaching peaks of 20,000 to 30,000 per 100 milliliters in recent years. At Roosevelt Island the averages generally have been below the Commission monthly average objective of 10,000 per 100 milliliter. However, as recently as 1955, a monthly average has been as high as 250,000 per 100 milliliters, and many monthly averages have been above the Commission's objective.

The effects of tidal action in carrying pollution upstream from the several points of sewage discharge apparently come into play at Giesboro Point. From this sampling station to Fort Washington there has been a steady trend of increasing bacterial contamination, which shows no signs of reversal, from 1938 to the present. This trend reflects the continued increase over the years in sewage discharged to the river, as shown in figure XVIII. The upward trend has been most pronounced in the vicinity of the Washington plant outlet, but has been unquestionable at Giesboro Point, Fort Foote, and Fort Washington.

At 4 of the 5 stations the coliform contamination has consistently been above the Interstate Commission's suggested objective of 10,000 per 100 mililiters. Only at Fort Washington has a majority of the averages been below the objective, but even here at least one monthly average each year since 1943 has exceeded the objective.

Figure XVI presents a composite picture of recent bacterial water quality of the Potomac River from Three Sisters Island to Hallowing Point. It is a picture of extreme bacterial contamination which renders the river hazardous to the health of those who use it for any type of recreation that involves contact with the water. A no point can it be considered safe for swimming. From Giesboro Point to Fort Foote the average coliform contents of the river water

have been equivalent roughly to that which would result from dilution of one part of raw sewage with 200 to 1,000 parts of clean water. Maximum monthly averages in this section have been equivalent to contamination that would result from dilution of raw sewage with 30 to 300 parts of clean water. Occasional single samples have yielded results indicative of dilutions as low as 1 to 10. The hazard of swallowing even a few drops of such highly contaminated water is obvious. This hazard is a real one to all who boat, fish, or even wade in the waters of this section of the Potomac. Some danger exists, in less acute form, from Roosevelt Island to Giesboro Point and from Fort Foote to Hallowing Point.

Dissolved oxygen

The dissolved oxygen data in the records of the Blue Plains plant have been analyzed for both trends in effects of organic sewage pollution and for recent effects of such pollution.

The minimum consecutive 28-day dissolved oxygen average for each year since 1938 has been computed. Generally this involved four samples taken at weekly intervals, but for 2 or 3 years only 2 results obtained at biweekly intervals were available. The minimum values obtained are shown in figures IX through XV. The charts include the minimum single dissolved oxygen value obtained during the 28-day period selected for each yearly minimum average. They incorporate, for comparison, the dissolved oxygen objectives suggested by the Interstate Commission on the Potomac River Basin. Heavy dashed lines, drawn by eye, indicate the trends in dissolved oxygen from 1938 through 1956. Comparable data from previous Public Health Service reports are included.

Figure XVII presents 3-year averages of the minimum consecutive 28-day dissolved oxygen annual averages, for 1954 through 1956, at all sampling stations from Three Sisters Island to Hallowing Point. It includes the minimum single dissolved oxygen value during the periods involved.

The trends in dissolved oxygen corroborate the evidence of the coliform organism data that the quality of water in most of this section of the Potomac has undergone continuing degradation. Only at Three Sisters Island has there been no evidence of decreasing dissolved oxygen. Here the minimum average content has remained consistently at a satisfactory level of about 7 parts per million. At Roosevelt Island there has been a slight drop, from about 7 to 6 parts per million, but the minimum dissolved oxygen level here has been satisfactory.

From Giesboro Point to Fort Foote the reduction in minimum average dissolved oxygen has been quite marked, from the range of 4 to 5 parts per million in 1938 to a range of 1 to 3 parts per million at the 4 sampling stations. Single minimum values in this section have been in the low range of 0.1 to 0.6 parts per million. The river is threatened with septic conditions over large areas that would cause a more severe odor nuisance than any that has been encountered to date.

At Fort Washington there has been a slight drop in dissolved oxygen from a range of 4 to 5 parts per million to about 4 parts per million.

The curve of 3-year minimum averages at all stations (fig. XVII) gives a composite picture of recent low dissolved oxygen levels. In 1955, the worst of the 3 years, minimum consecutive 28-day averages in the zone of heaviest pollution were 0.5 to 1.2 parts per million lower than were the 3-year averages. Minimum values on single samples in this section were in the range of 0.2 to 0.6 parts per million.

Only in the Three Sisters Island to Roosevelt Island section of the river did the dissolved oxygen meet the objectives of the Interstate Commission on the Potomac River Basin. These objectives have been agreed upon as reasonable by all agencies involved, with one exception. District of Columbia representatives have felt that the dissolved oxygen objectives are somewhat stringent.

A 6-mile section of the Potomac River, from about Giesboro Point to Fort Foote, extending 2.5 miles above and 3.5 miles below the Blue Plains sewage treatment plant outlet, is approaching a disastrous condition of dissolved oxygen depletion. Under recent conditions only the coarsest and most pollution-resistant fish could be expected to inhabit this section. For at least 20 miles the dissolved oxygen has been below the minimum of 5.0 parts per million usually considered suitable for propagation of a variety of desirable fishes.

A summer of usually prolonged and severe low flow and high temperature conditions might well cause the dissolved oxygen in the vicinity of the Blue Plains plant to go to total depletion, with resulting odor due to septicity and destruction of such fish as inhabit the waters of the area.

The severe effects of pollution indicated by coliform organism and dissolved oxygen content of the Potomac River in the Washington area have resulted principally from sewage discharged from the outlets of the major treatment plants of the Washington metropolitan area.

Public nuisances

Most of the dry-weather flow of sewage in the Washington area now receives treatment that should minimize floating sewage solids and sludge deposits. However, substantial areas of localized nuisances result principally from raw sewage discharged from storm sewers and overloaded interceptors.

The areas that have caused most frequent objections are the waterfront opposite the Lincoln Memorial, the Washington Channel, the Anacostia River, and the backwater areas of Four Mile Run and Hunting Creek.

District of Columbia storm sewers and overloaded interceptors have largely been responsible for the nuisances near the Lincoln Memorial and along the Washington Channel.

Washington Suburban Sanitary District sewage has been the principal offender in the Anacostia River, but this condition has been much improved by the recent routing of the sanitary-district sewage to the District of Columbia treatment plant. Only the overloaded interceptor that overflows to the Anacostia at Blaine Street still poses a problem there.

The installation and operation of the Virginia communities' sewage treatment plants have done much to improve the Four Mile Run and Hunting Creek areas. Floating solids no longer should cause objection in these areas. Sewage from the Arlington primary treatment plant still was causing odor in the backwater from the river at the mouth of Four Mile Run during the week of April 28. There was some odor in Hunting Creek immediately below the point of discharge from the Alexandria intermediate treatment plant.

Similar nuisance conditions undoubtedly will occur along the Alexandria waterfront from time to time because of storm-water overflows there.

The several areas of nuisance constitute the major factor that has focussed the public's attention on the pollution problem, and has engendered such an insistent demand for cleaning up the Potomac River. The floating sewage solids affront the sight, and the sewage sludge deposits cause odors offensive to the sense of smell. There are literally thousands who can attest to the fact that these localized nuisances have caused sections of the Potomac in the Washington area to be extremely objectionable. Equally certain is the fact that, no matter what sewage treatment is provided at existing plant sites, the public will not accept the Potomac as a clean river until the raw-sewage overflow nuisances are eliminated.

INTERFERENCE WITH WATER USES

Water uses with which existing pollution of the Potomac River interferes in the Washington metropolitan area have been mentioned in connection with the various effects of pollution on water quality. These uses are summarized in this section.

The section of the river involved in this report does not serve as a source of public water supply, and is not likely to be used for this purpose in the foreseeable future. The District of Columbia water supply is drawn from the Potomac above Great Falls, far upstream from the river section under discussion.

The river is an important recreational asset to residents of the area and to visitors. Its recreational use takes a variety of forms.

Its scenic value is great, but is minimized when the viewer detects a sewage or septic odor from its waters, or notes objectionable floating matter on its surface in those localized areas when raw sewage overflows occur.

Many areas along the waterfront are used for public recreation. The waterfront uses involve picnicking, fishing, sightseeing, sports, and commercial eating establishments. The pleasure from these uses can be increased by proximity to a body of clean water. Along the Potomac in the Washington area the pleasure often is minimized by odor and unsightly floating material from raw sewage overflows. Any direct contact with the water incidental to the waterfront uses involves a potential health hazard because of contamination by sewage bacteria. The hazard exists to some degree from Roosevelt Island to Hallowing Point and is most acute from Giesboro Point to Fort Foote. Fish taken from this section carry contamination that presents a hazard to the fisher-

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men and to those who eat the fish unless they are thoroughly cleaned and cooked.

Use of the river for water sports is important to the area. Bacterial contamination renders the river hazardous for swimming at least from Three Sisters Island to Hallowing Point, and probably even farther downstream. There is relatively little swimming in the Potomac in the immediate vicinity of Washington because of the general knowledge of its polluted condition and the generally unsuitable physical characteristics of the river bottom. There is little probability that the river can be made suitable for swimming between Roosevelt Island and Fort Washington regardless of any improvements made in sewage disposal . Proper treatment of all sewage in the area should assure water quality safe for swimming downstream from Fort Washington. The river is widely used for pleasure boating. This use inevitably involves some direct contact with the water, and possibly poses the single greatest hazard to health resulting from excessive contamination of the river by sewage bacteria.

The river is used as a source of water supply by several industries in the area. There is no known case of interference by pollution with the industrial processes. Those workers who come in direct contact with the untreated water are subjected to the health hazards described in connection with recreational uses.

Navigation is an important use of the river. The sewage pollution presents no interference to navigation as such, but exposes those engaged in this occupation to the health hazards of direct contact with the water.

A major public nuisance resulting from the pollution does not involve use of the water, but is probably the single major factor in the public's awareness of the polluted condition of the Potomac. This is the odor which, at certain times of the year, is so obvious to those whose pursuits bring them in the general vicinity of the river in the Washington metropolitan area. Raw sewage overflows from storm sewers and overloaded interceptors, rather than treated sewage effluents, are primarily responsible for this nuisance.

The Potomac plays an essential role in the welfare of the metropolitan area through its capacity to receive and carry away liquid wastes. Employment of this capacity is a proper use of the river provided that the wastes receive such treatment as is necessary to avoid undue interference with other reasonable and essential uses. In the Washington metropolitan area this use has become an abuse through failure of sewage treatment to keep pace with growth in sewered population.

Summary

The history of interstate pollution of the Potomac River in the Washington metropolitan area has been one of continuing degradation of water quality since the first comprehensive survey of pollution in 1913–14.

The degradation has resulted from failure to counterbalance the effects of a rapidly expanding sewered population by timely provision of sewage treatment faciilties. The 1957 sewered population equivalent of 1,678,000 is five times the 320,000 population of 1913. Percent sewage treatment reduces the strength of the raw sewage only 32 percent. The treated sewage load to the river in 1957 is equivalent to the untreated sewage from 1,143,000 persons. This is nearly four times the load in 1913.

The effects of the unchecked increase in sewage load discharged to the Potomac are reflected by bacterial contamination and dissolved oxygen depletion of the river water from 1938 through 1956. There are increasing trends in coliform organisms from Giesboro Point to Fort Washington, and decreasing trends in dissolved oxygen from Roosevelt Island to Fort Washington.

Bacterial contamination from sewage presents a health hazard to anyone swimming in the river throughout the entire 23-mile section from Three Sisters Island to Hallowing Point. There is a health hazard even in casual contact with the water, such as that inherent in wading, fishing and boating, from Roosevelt Island to Marshall Hall. This hazard is acute from Giesboro Point to Fort Foote.

The minimum average dissolved oxygen for 1954 through 1956 consistently falls below 4.0 parts per million in an 11-mile section from above Giesboro Point to Fort Washington. In the vicinity of the District of Columbia sewer outlet the minimum average falls to the very low value of 2.4 parts per million. Several single samples have yielded extremely critical values of only a few tenths of a part per million. Only at Three Sisters and Roosevelt islands was the dissolved oxygen at a satisfactory level. These points are above the effects

of pollution carried upstream along the Washington waterfront by tidal action. If the present trend of increasing pollution continues it will be a matter of only a few years until total oxygen depletion, with its attendant septic odors and destruction of fish, will occur during periods of high temperature and low streamflow. Even now a severe summer of prolonged low streamflow and high temperature might culminate in this disastrous condition. At present only coarse and pollution resistant fishes, such as carp and catfish, can inhabit these waters from Giesboro Point to Fort Foote. Most game fish can be expected to avoid the river as far downstream as Hallowing Point.

The sewage that causes this interstate pollution originates in the following major areas.

Area	Percent of total sewered population equivalent	Percent of total load to river
Alexandria, Va.	6.4	3.3
Arlington County, Va.	10.6	9.0
District of Columbia	75.3	82.8
(Washington Suburban Sanitary District, Maryland) [1]	(25.6)	(28.2)
Fairfax County, Va.	5.2	3.3

[1] Sewage treated in District of Columbia plant.

These figures speak for themselves. The District of Columbia discharges more than four-fifths of the total load of sewage pollution to the river. The three Virginia communities combined contribute less than one-sixth of the total pollution load.

Another, and perhaps equally important, problem is that of raw sewage overflows. Areas where storm water overflows occur are along the District of Columbia waterfront from Three Sisters Island to Memorial Bridge, along Rock Creek and Anacostia River, and along the Alexandria waterfront upstream from the mouth of Hunting Creek.

The District of Columbia also has overloaded interceptors. Two overflows, at 27th and G Streets and the Watergate, in the vicinity of the Lincoln Memorial, have been reported to discharge raw sewage frequently in the past. More recent information is that overflow here is rare during dry weather. The interceptor carrying Washington Suburban Sanitary District sewage along the Anacostia River to the District of Columbia sewage-treatment plant is overloaded, and discharges raw sewage to the Anacostic at Blaine Street.

The areas where raw sewage discharges are the foci of public complaints regarding pollution in the vicinity of Washington. In these areas the floating material in raw sewage collects on the surface of the water to offend the aesthetic senses. The settleable solids sink to the bottom to accumulate as sludge deposits. These deposits undergo septic decomposition to give off the rotton egg odor of hydrogen sulfide.

Areas of the Potomac that have been notorious for unsightly and malodorous conditions are in the vicinity of Lincoln Memorial and the Washington Channel. The lower Anacostia also has been an offender of long standing. The backwaters of Four Mile Run and Hunting Creek were little more than septic pools before the Virginia communities provided sewage treatment facilities. There has been improvement in these areas, but only recently odor was noted at the mouth of Four Mile Run below the Arlington treatment plant.

Much effort and money has been expended on sewage treatment in the Washington metropolitan area. Commendable progress has been and is being made. However, it is evident that pollution of the Potomac River in the Washington metropolitan area constitutes pollution of interstate waters subject to abatement under the Federal Water Pollution Control Act as such pollution endangers the health and welfare of persons in States other than those in which the discharges contributing to such pollution originates.

APPENDIX

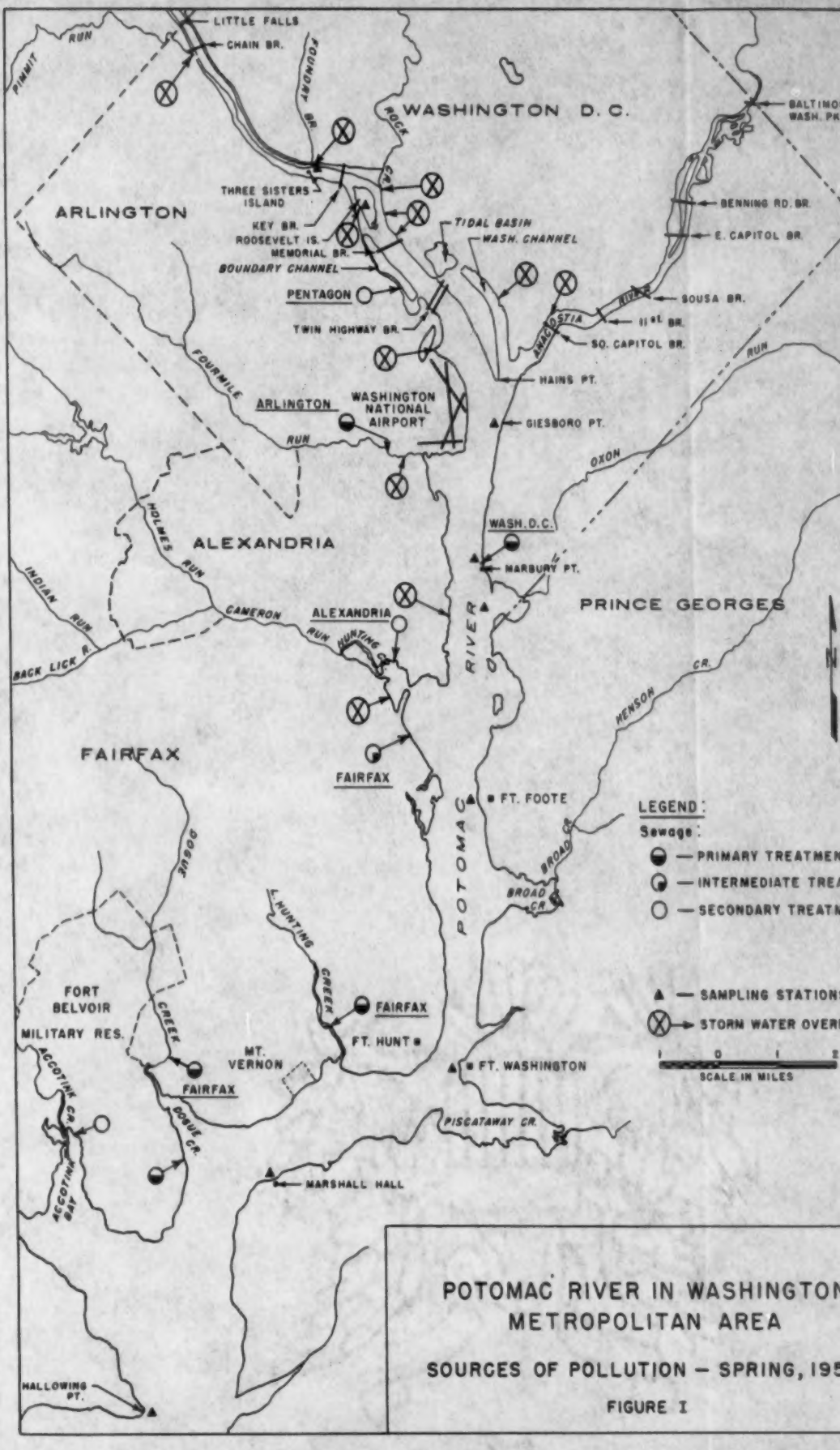
TABLE I.—*Sources of pollution discharged to Potomac River in the Washington, D. C., metropolitan area, spring 1957*

[Dry weather flows]

Source	Location on Potomac	Biochemical oxygen demand, pounds per day			Population equivalent [1]		Percent of total load to Potomac	
		Raw	Effluent	Percent removal	Raw	Effluent	Population served	Treated effluent
Alexandria	Hunting Creek	19,330	6,950	64.0	107,370	38,610	6.4	3.3
Arlington	Fourmile Run	32,120	18,550	42.2	178,450	103,070	10.6	9.0
Fairfax:								
Westgate plant	Hunting Creek	13,110	5,780	55.9	(72,810)	(32,140)		
Pimmit Run	Pimmit Run, 3 miles upstream			35.9	(8,370)	(1,460)		
Little Hunting Creek	Little Hunting Creek			35.0	(3,900)	(2,540)		
Dogue Creek	Dogue Creek			35.0	(2,250)	(1,460)		
Total, Fairfax					87,330	37,600	5.2	3.3
District of Columbia	Marbury Point	227,200	170,300	25.0	1,262,100	946,020	75.3	82.8
Do	66 percent							
Washington Suburban Sanitary District	34 percent							
Pentagon	Boundary Channel	3,120	330	89.5	17,340	1,820	1.0	0.2
Fort Belvoir	Dogue Creek			[2] 30.0	[2] 25,000	[2] 16,000	1.5	1.4
Total					1,677,590	1,143,120	100.0	100.0

[1] Based on 0.18 pounds biochemical oxygen demand per capita.

[2] Estimated.



POTOMAC RIVER IN WASHINGTON METROPOLITAN AREA

SOURCES OF POLLUTION – SPRING, 195

FIGURE I

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WASHINGTON D.C.
ARLINGTON
ALEXANDRIA
FAIRFAX
1000

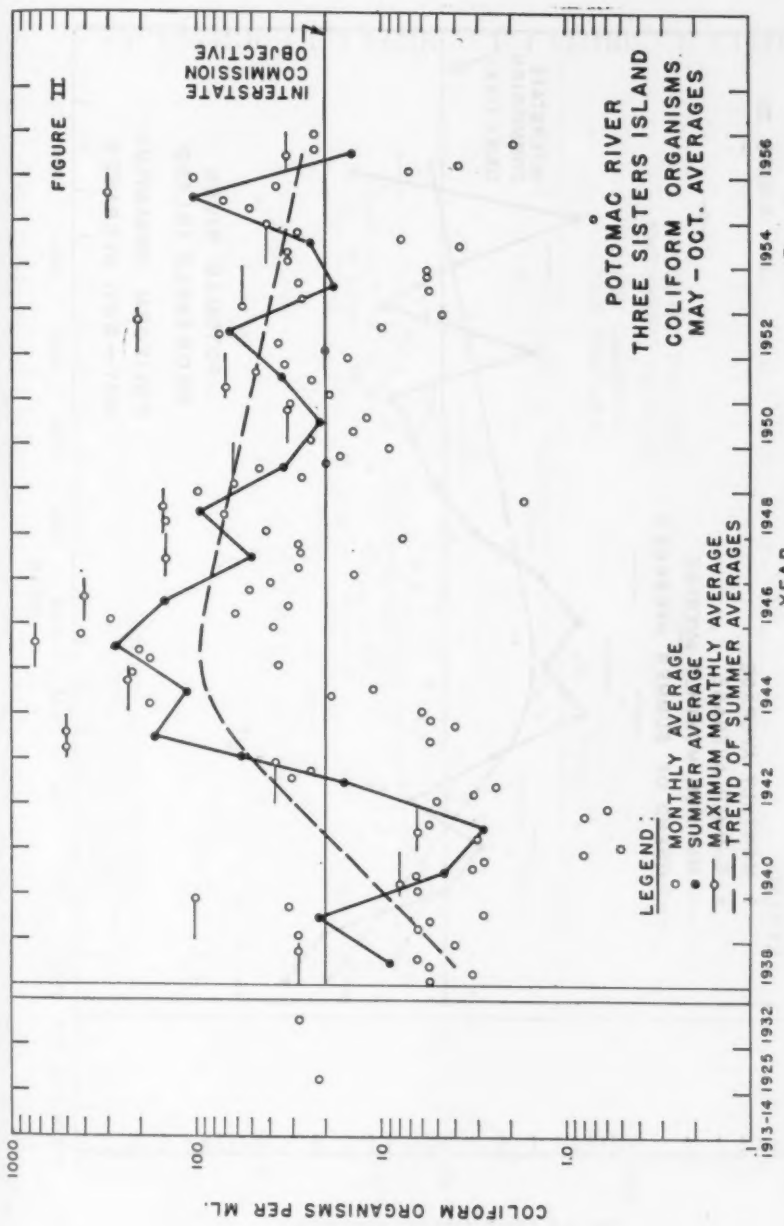
FIGURE II
INTERSTATE COMMISSION OBJECTIVE
POTOMAC RIVER
THREE SISTERS ISLAND
COLIFORM ORGANISMS
MAY - OCT. AVERAGES
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MAXIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
YEAR
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
1000
100
10
1.0
COLIFORM ORGANISMS PER ML.

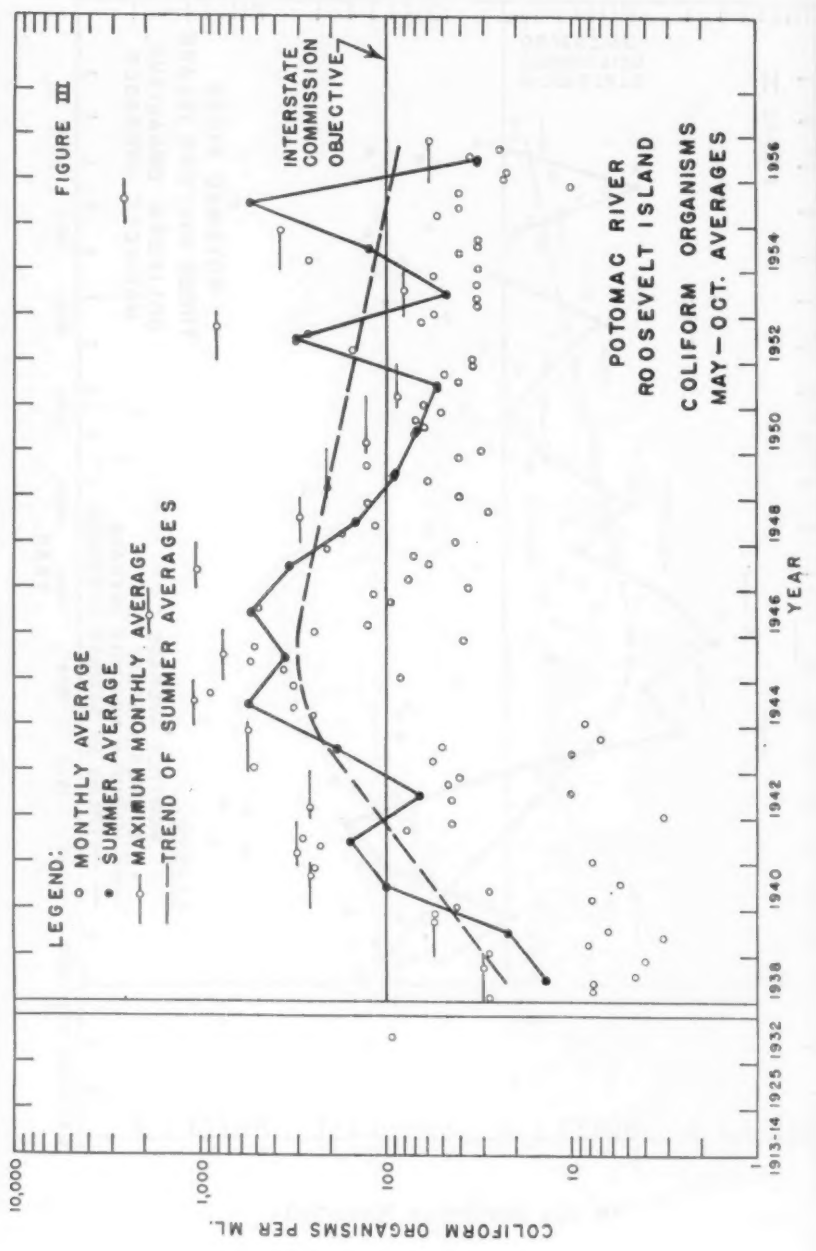
FIGURE III
POTOMAC RIVER
ROOSEVELT ISLAND
COLIFORM ORGANISMS
MAY—OCT. AVERAGES
INTERSTATE COMMISSION OBJECTIVE
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MAXIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
COLIFORM ORGANISMS PER ML.
10,000
1,000
100
10
1
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
YEAR

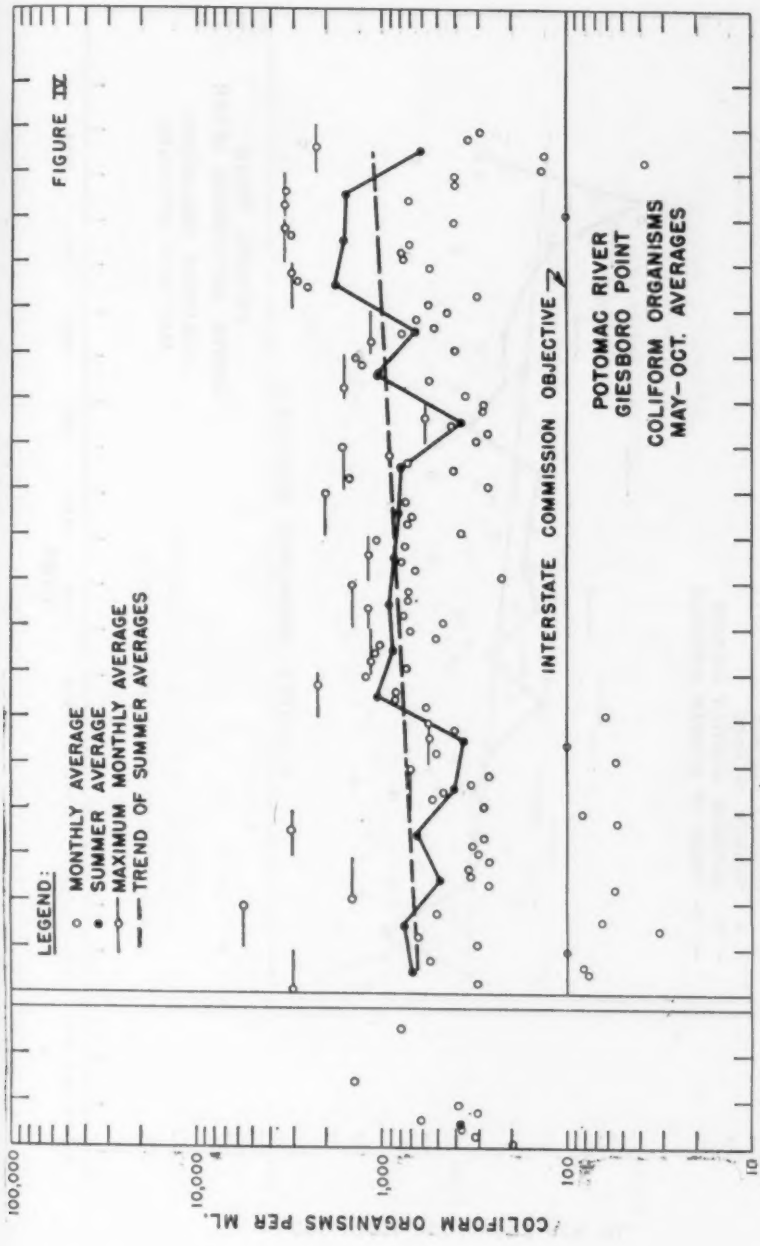
FIGURE IX
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MAXIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
INTERSTATE COMMISSION OBJECTIVE
POTOMAC RIVER
GIESBORO POINT
COLIFORM ORGANISMS
MAY-OCT. AVERAGES
COLIFORM ORGANISMS PER ML.
100,000
10,000
1,000
100
10
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
YEAR

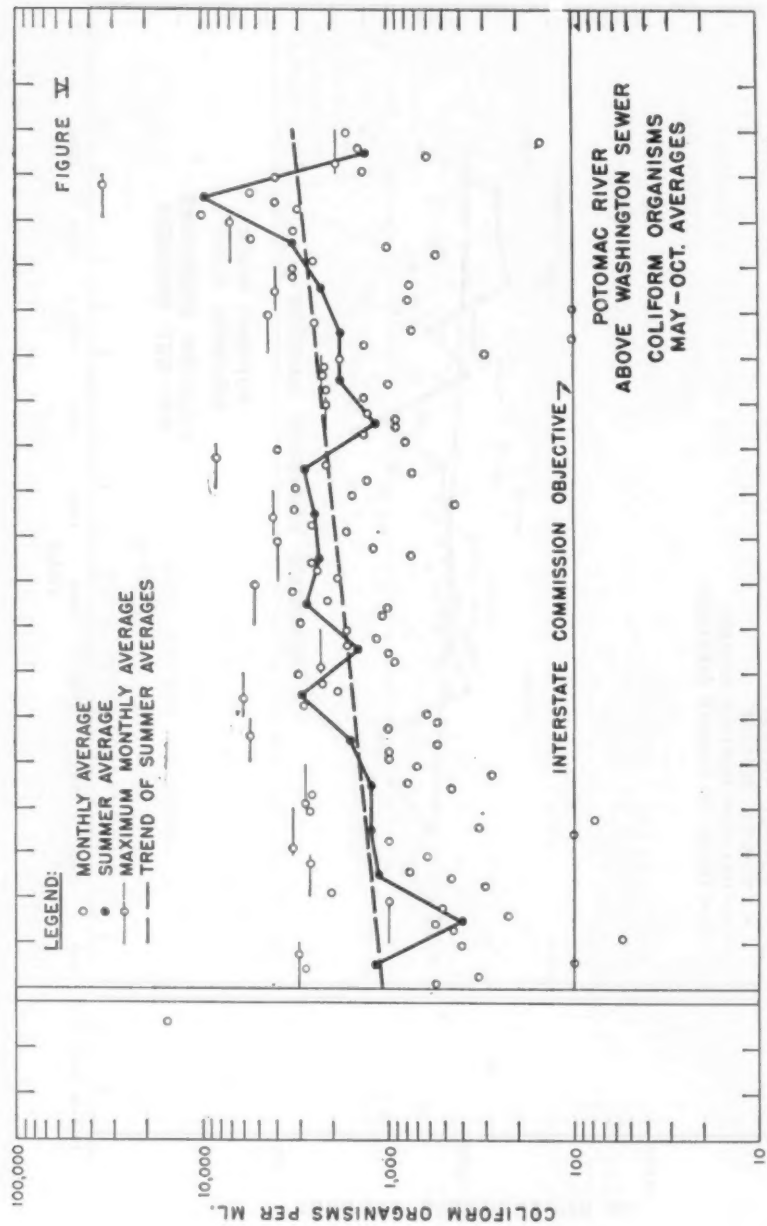
FIGURE II
POTOMAC RIVER
ABOVE WASHINGTON SEWER
COLIFORM ORGANISMS
MAY-OCT. AVERAGES
INTERSTATE COMMISSION OBJECTIVE
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MAXIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
COLIFORM ORGANISMS PER ML.
100,000
10,000
1,000
100
10
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
YEAR

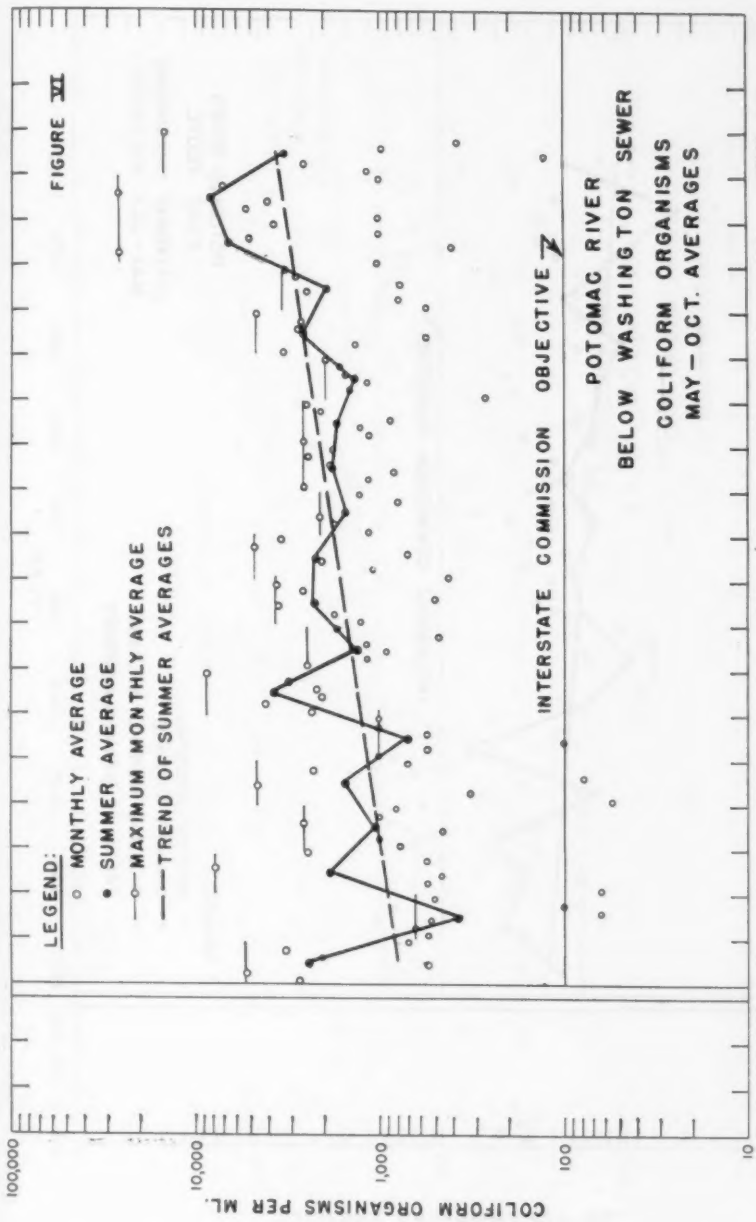
FIGURE XI
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MAXIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
INTERSTATE COMMISSION OBJECTIVE
POTOMAC RIVER
BELOW WASHINGTON SEWER
COLIFORM ORGANISMS
MAY – OCT. AVERAGES
COLIFORM ORGANISMS PER ML.
100,000
10,000
1,000
100
10
1913-14
1925
1932
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956
YEAR

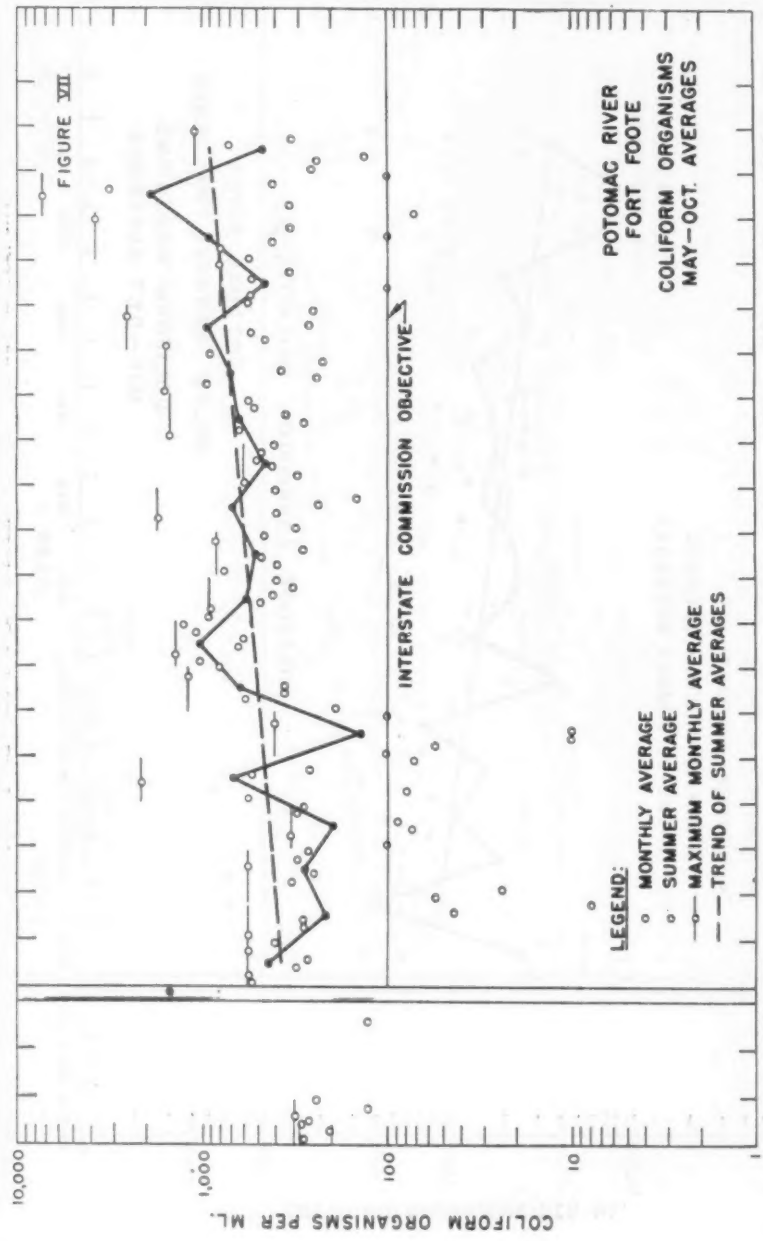
FIGURE VIII
POTOMAC RIVER
FORT FOOTE
COLIFORM ORGANISMS
MAY—OCT. AVERAGES
INTERSTATE COMMISSION OBJECTIVE
LEGEND:
o MONTHLY AVERAGE
o SUMMER AVERAGE
—o— MAXIMUM MONTHLY AVERAGE
— — TREND OF SUMMER AVERAGES
COLIFORM ORGANISMS PER ML.
10,000
1,000
100
10
1
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
YEAR

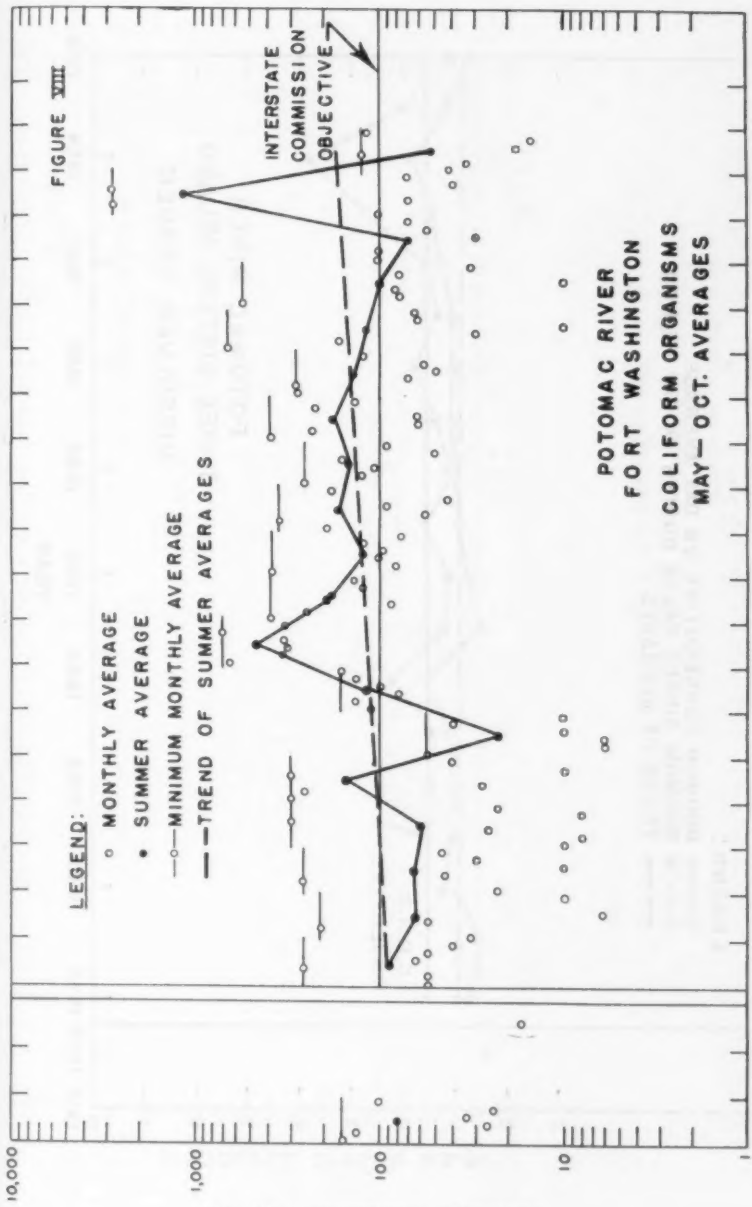
FIGURE XIII
INTERSTATE COMMISSION OBJECTIVE
LEGEND:
MONTHLY AVERAGE
SUMMER AVERAGE
MINIMUM MONTHLY AVERAGE
TREND OF SUMMER AVERAGES
POTOMAC RIVER
FORT WASHINGTON
COLIFORM ORGANISMS
MAY — OCT. AVERAGES
YEAR
1913-14 1925 1932 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
10,000
1,000
100
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1
COLIFORM ORGANISMS PER ML.

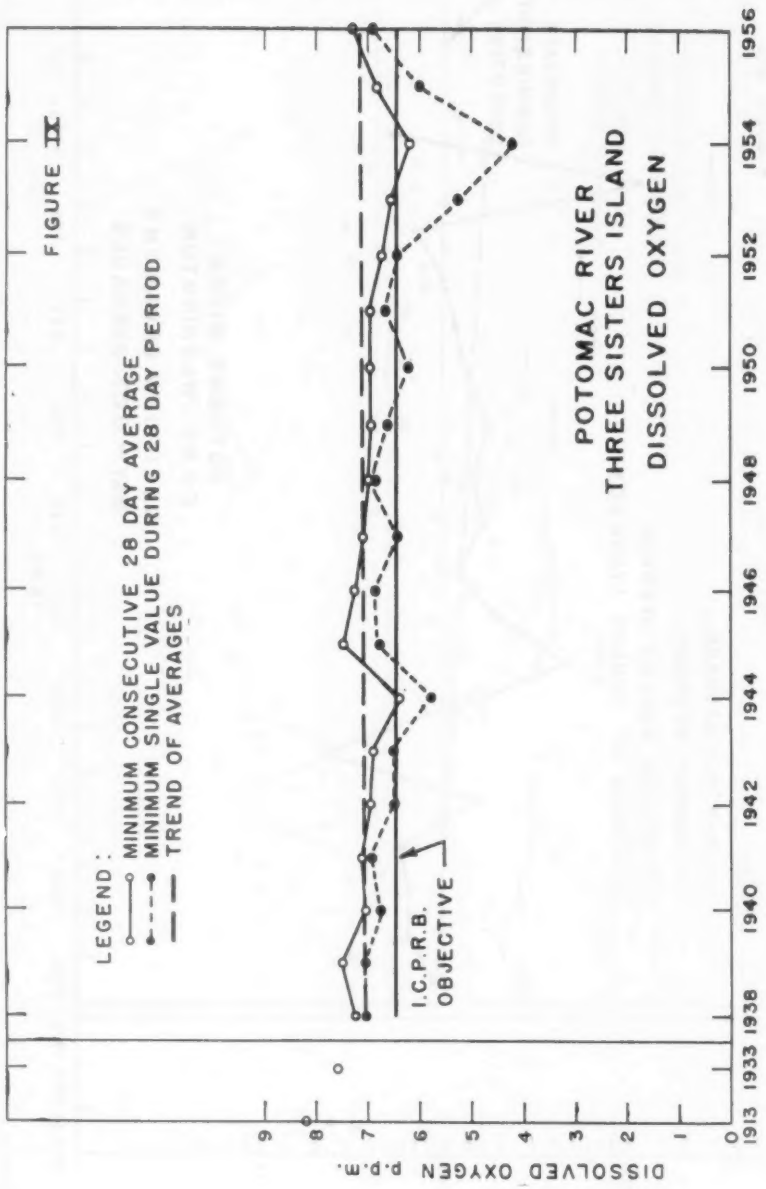


FIGURE IX
LEGEND:
MINIMUM CONSECUTIVE 28 DAY AVERAGE
MINIMUM SINGLE VALUE DURING 28 DAY PERIOD
TREND OF AVERAGES
I.C.P.R.B. OBJECTIVE
POTOMAC RIVER
THREE SISTERS ISLAND
DISSOLVED OXYGEN
DISSOLVED OXYGEN p.p.m.
YEAR
0
1
2
3
4
5
6
7
8
9
1913
1933
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956

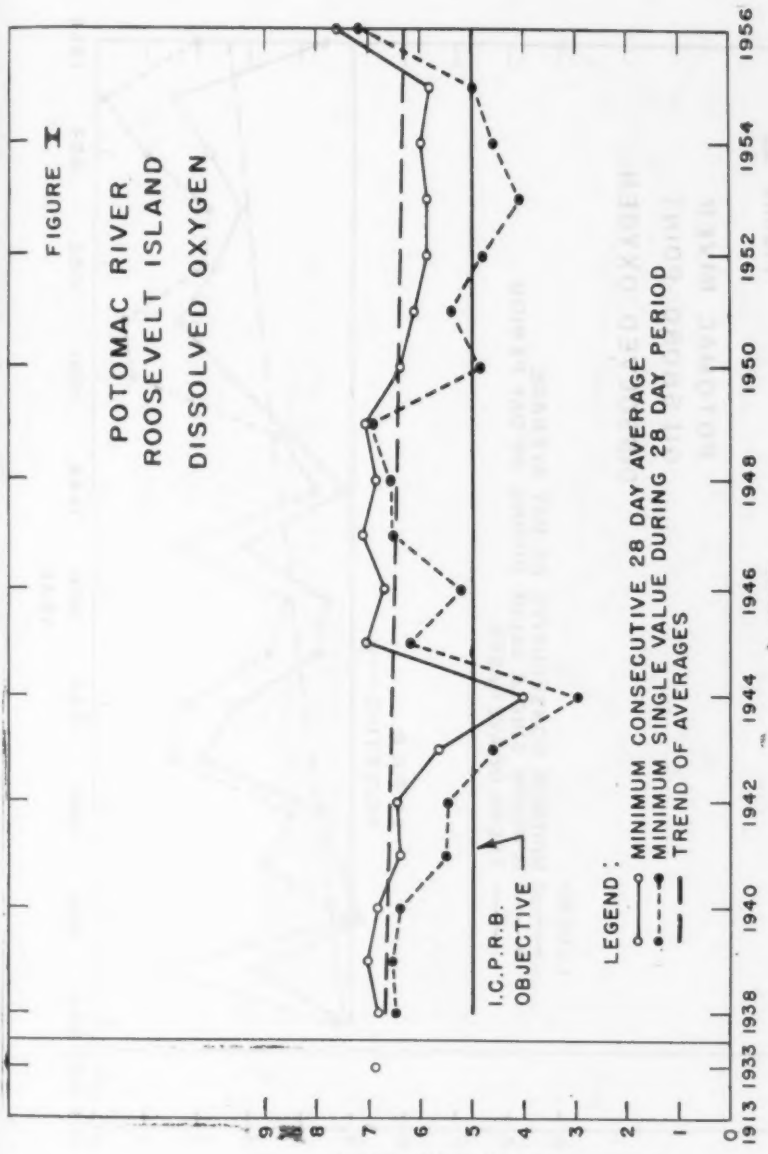


FIGURE X
POTOMAC RIVER
ROOSEVELT ISLAND
DISSOLVED OXYGEN
DISSOLVED OXYGEN p.p.m.
YEAR
1913 1933 1938 1940 1942 1944 1946 1948 1950 1952 1954 1956
0 1 2 3 4 5 6 7 8 9
I.C.P.R.B. OBJECTIVE
LEGEND:
MINIMUM CONSECUTIVE 28 DAY AVERAGE
MINIMUM SINGLE VALUE DURING 28 DAY PERIOD
TREND OF AVERAGES

FIGURE XI

POTOMAC RIVER
GIESBORO POINT
DISSOLVED OXYGEN

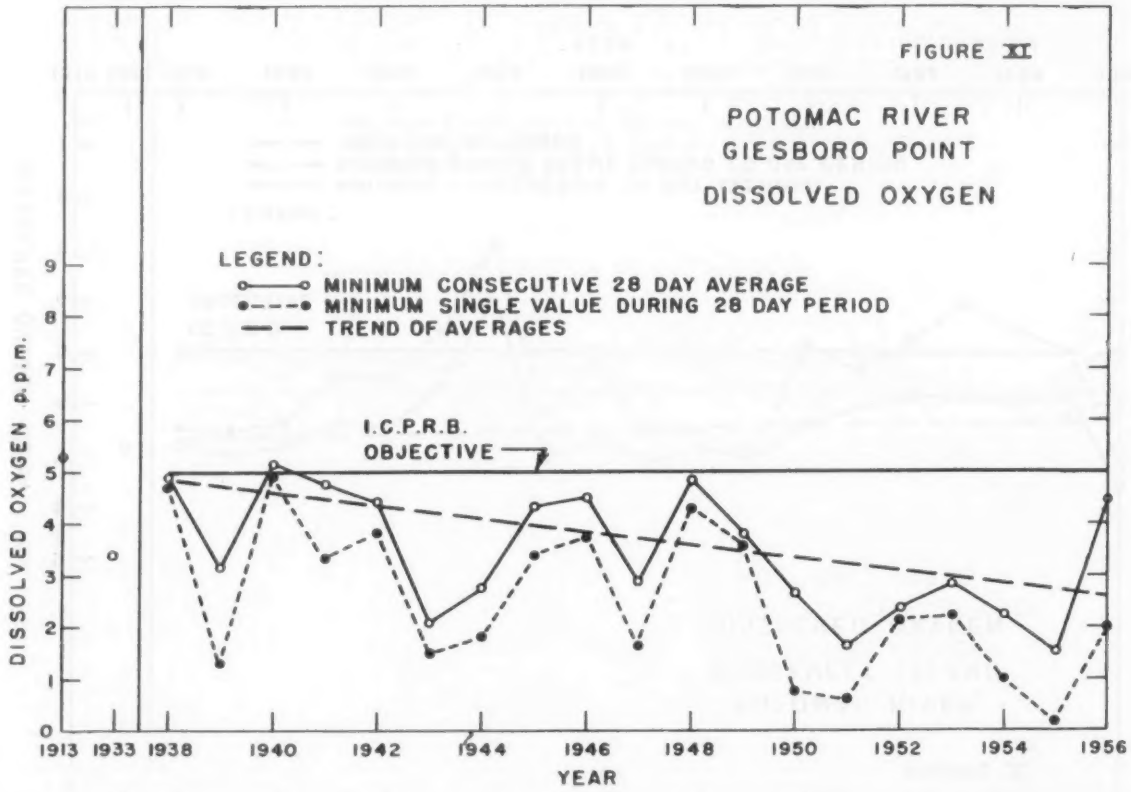


FIGURE XII

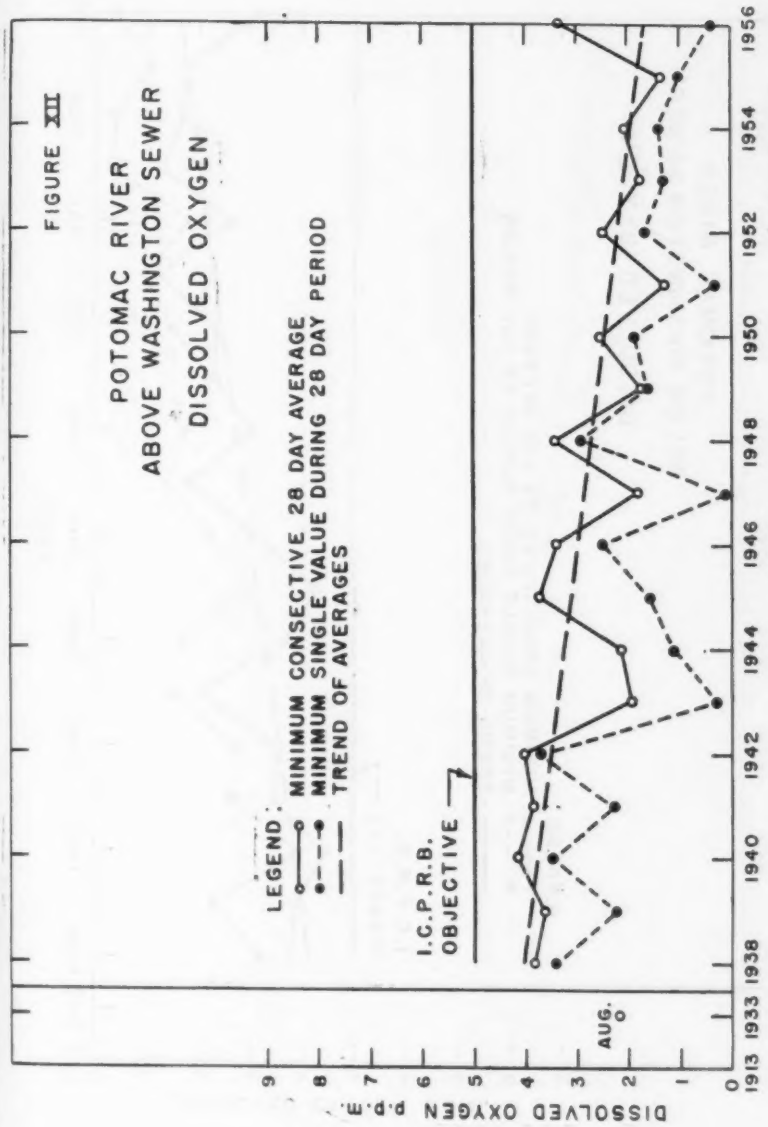
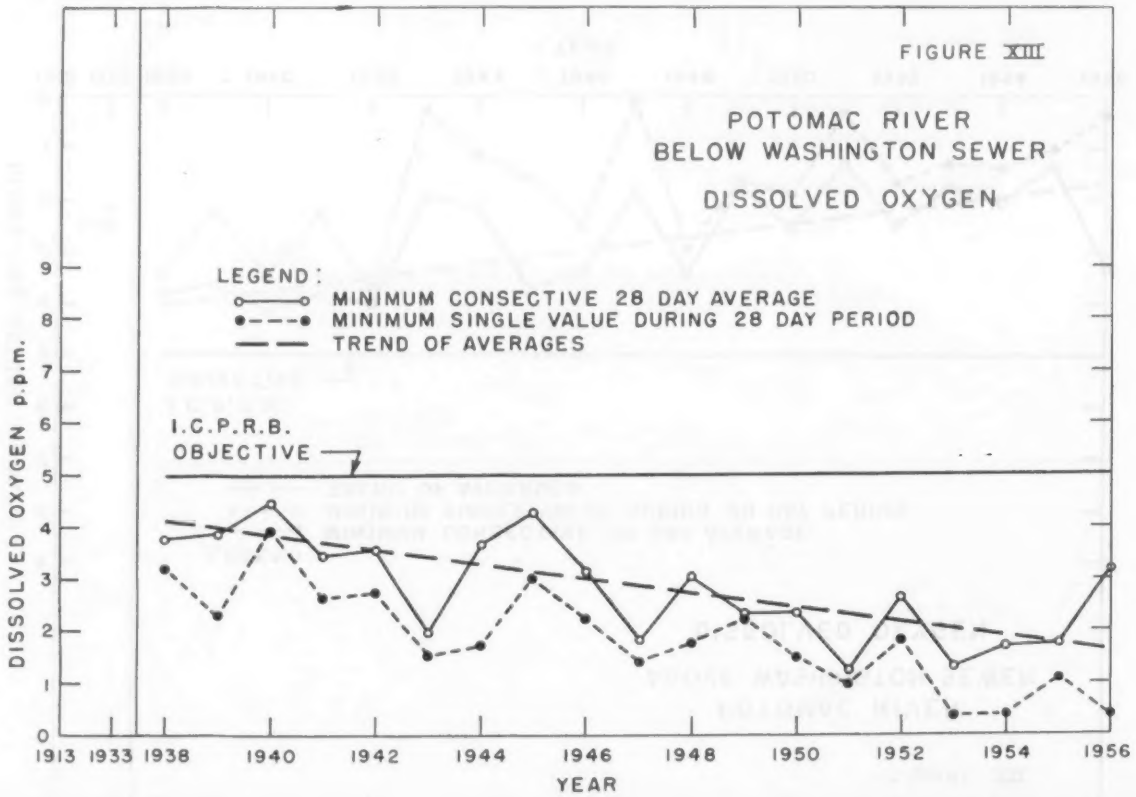


FIGURE XII
POTOMAC RIVER
ABOVE WASHINGTON SEWER
DISSOLVED OXYGEN
LEGEND:
MINIMUM CONSECTIVE 28 DAY AVERAGE
MINIMUM SINGLE VALUE DURING 28 DAY PERIOD
TREND OF AVERAGES
I.C.P.R.B.
OBJECTIVE
AUG.
DISSOLVED OXYGEN p.p.m.
YEAR
0
1
2
3
4
5
6
7
8
9
1913
1933
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956

FIGURE XIII

POTOMAC RIVER
BELOW WASHINGTON SEWER

DISSOLVED OXYGEN



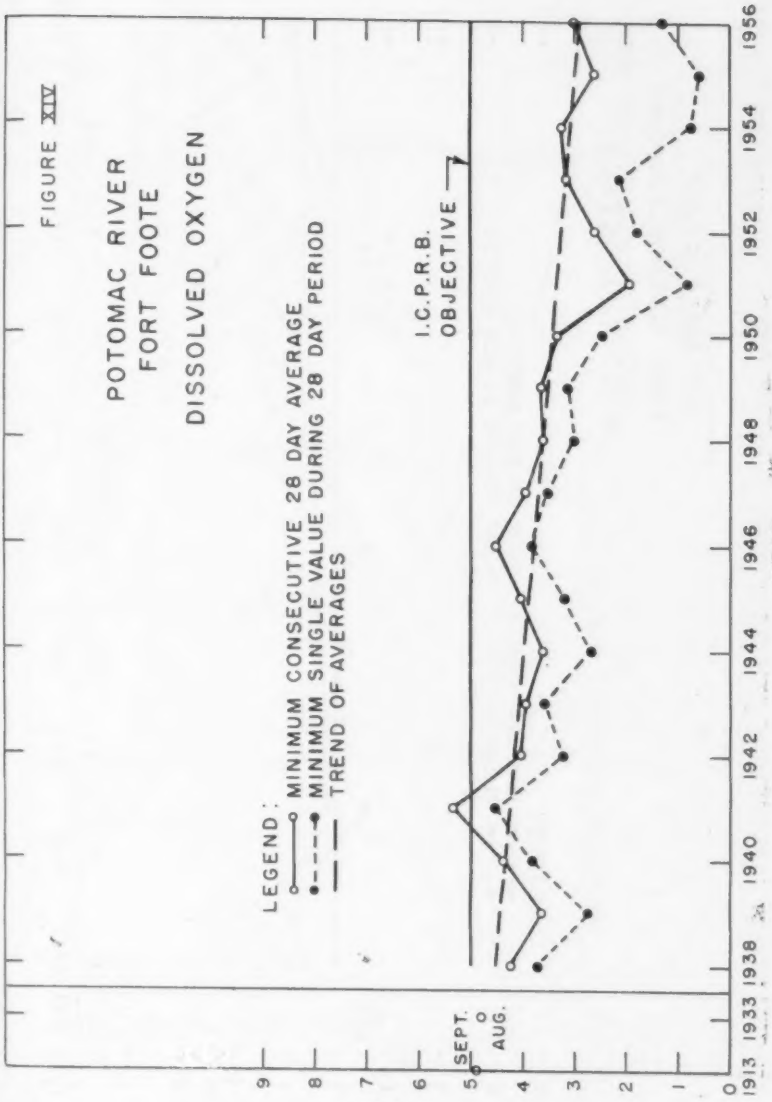


FIGURE XIV
POTOMAC RIVER
FORT FOOTE
DISSOLVED OXYGEN
LEGEND:
MINIMUM CONSECUTIVE 28 DAY AVERAGE
MINIMUM SINGLE VALUE DURING 28 DAY PERIOD
TREND OF AVERAGES
I.C.P.R.B.
OBJECTIVE
SEPT.
AUG.
DISSOLVED OXYGEN p.p.m.
YEAR
0
1
2
3
4
5
6
7
8
9
1913
1933
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956

25182—58——35

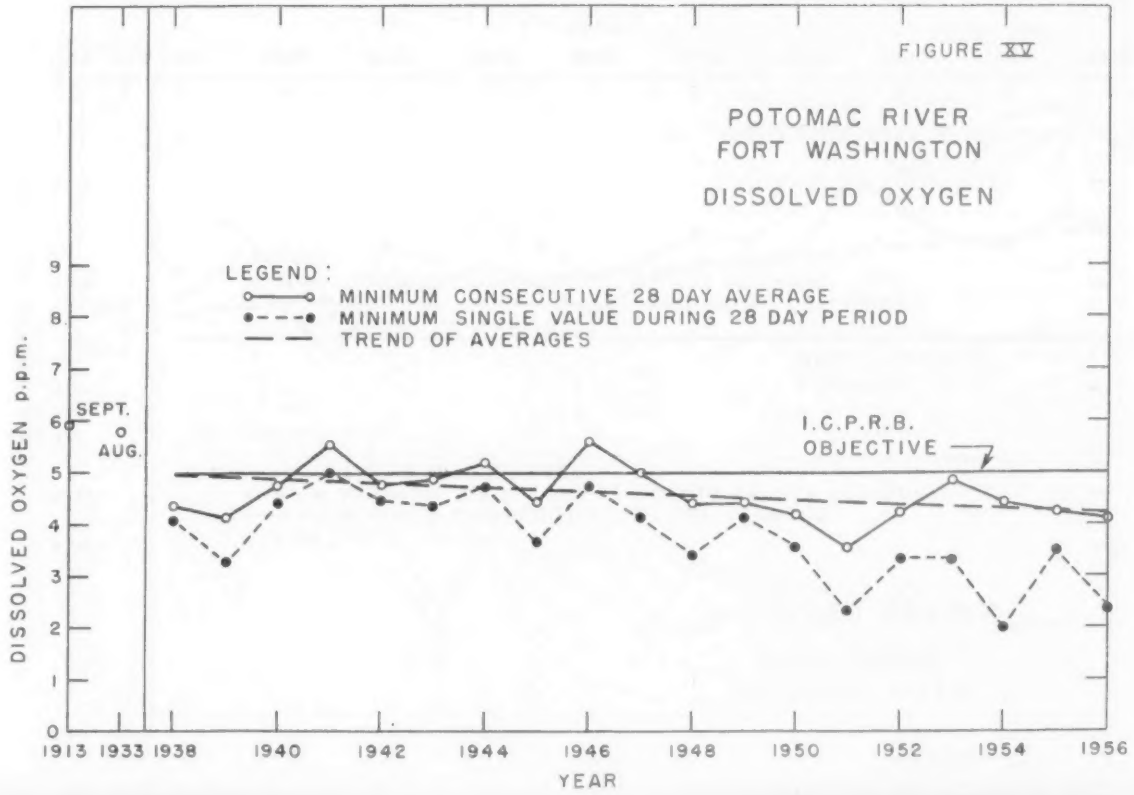


FIGURE XV
POTOMAC RIVER
FORT WASHINGTON
DISSOLVED OXYGEN
LEGEND :
MINIMUM CONSECUTIVE 28 DAY AVERAGE
MINIMUM SINGLE VALUE DURING 28 DAY PERIOD
TREND OF AVERAGES
I.C.P.R.B.
OBJECTIVE
SEPT.
AUG.
DISSOLVED OXYGEN p.p.m.
0
1
2
3
4
5
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7
8
9
1913
1933
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956
YEAR

100,000

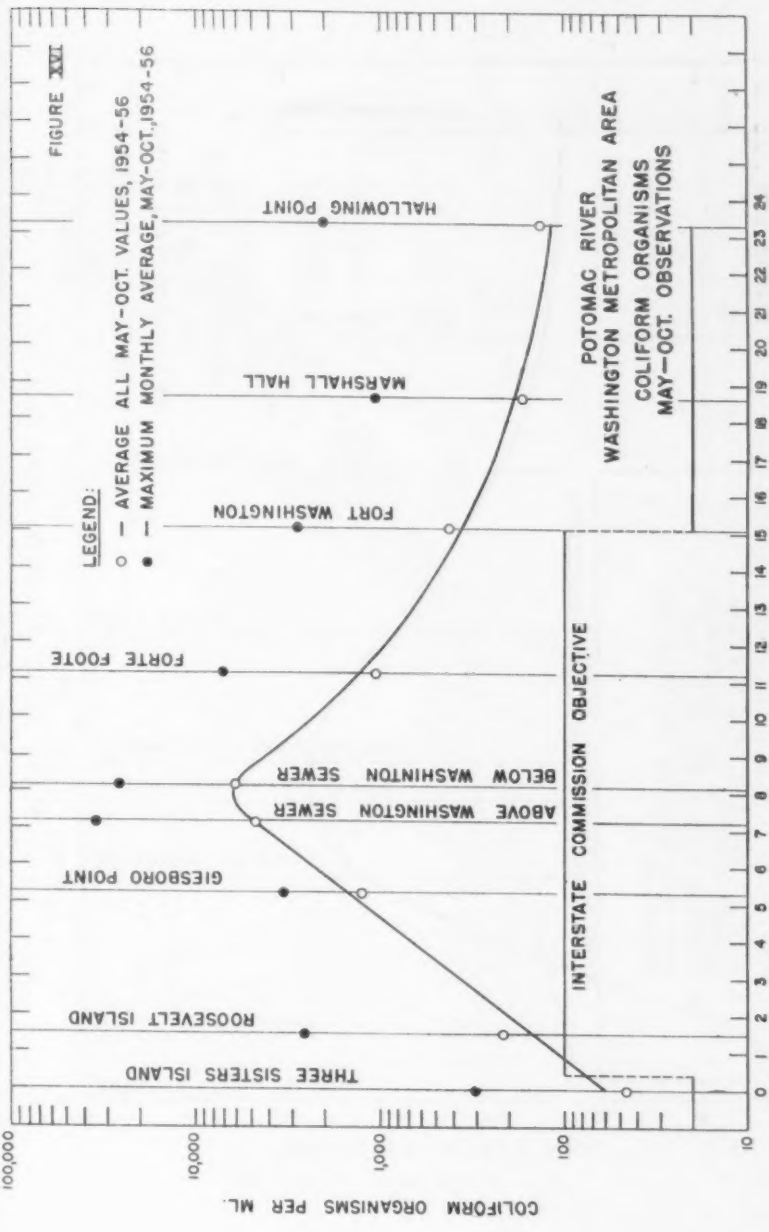
FIGURE XVI
LEGEND:
○ — ○ AVERAGE ALL MAY-OCT. VALUES, 1954-56
● — ● MAXIMUM MONTHLY AVERAGE, MAY-OCT., 1954-56
POTOMAC RIVER
WASHINGTON METROPOLITAN AREA
COLIFORM ORGANISMS
MAY—OCT. OBSERVATIONS
HALLOWING POINT
MARSHALL HALL
FORT WASHINGTON
FORTE FOOTE
BELOW WASHINGTON SEWER
ABOVE WASHINGTON SEWER
GIESBORO POINT
ROOSEVELT ISLAND
THREE SISTERS ISLAND
INTERSTATE COMMISSION OBJECTIVE
MILES BELOW THREE SISTERS ISLAND
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
COLIFORM ORGANISMS PER ML.
100,000
10,000
1,000
100
10

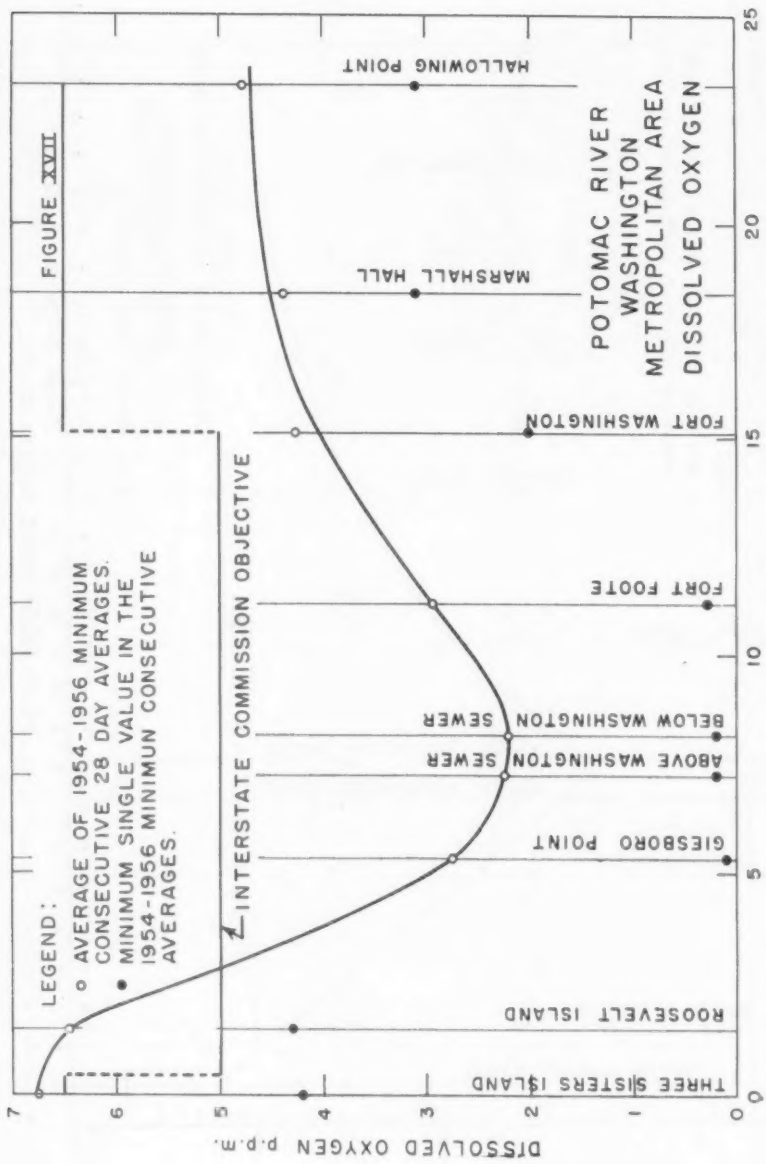
FIGURE XVIII
POTOMAC RIVER
WASHINGTON
METROPOLITAN AREA
DISSOLVED OXYGEN
LEGEND:
o AVERAGE OF 1954-1956 MINIMUM CONSECUTIVE 28 DAY AVERAGES.
• MINIMUM SINGLE VALUE IN THE 1954-1956 MINIMUN CONSECUTIVE AVERAGES.
INTERSTATE COMMISSION OBJECTIVE
HALLOWING POINT
MARSHALL HALL
FORT WASHINGTON
FORT FOOTE
BELOW WASHINGTON SEWER
ABOVE WASHINGTON SEWER
GIESBORO POINT
ROOSEVELT ISLAND
THREE SISTERS ISLAND
DISSOLVED OXYGEN p.p.m.
MILES BELOW THREE SISTERS ISLAND

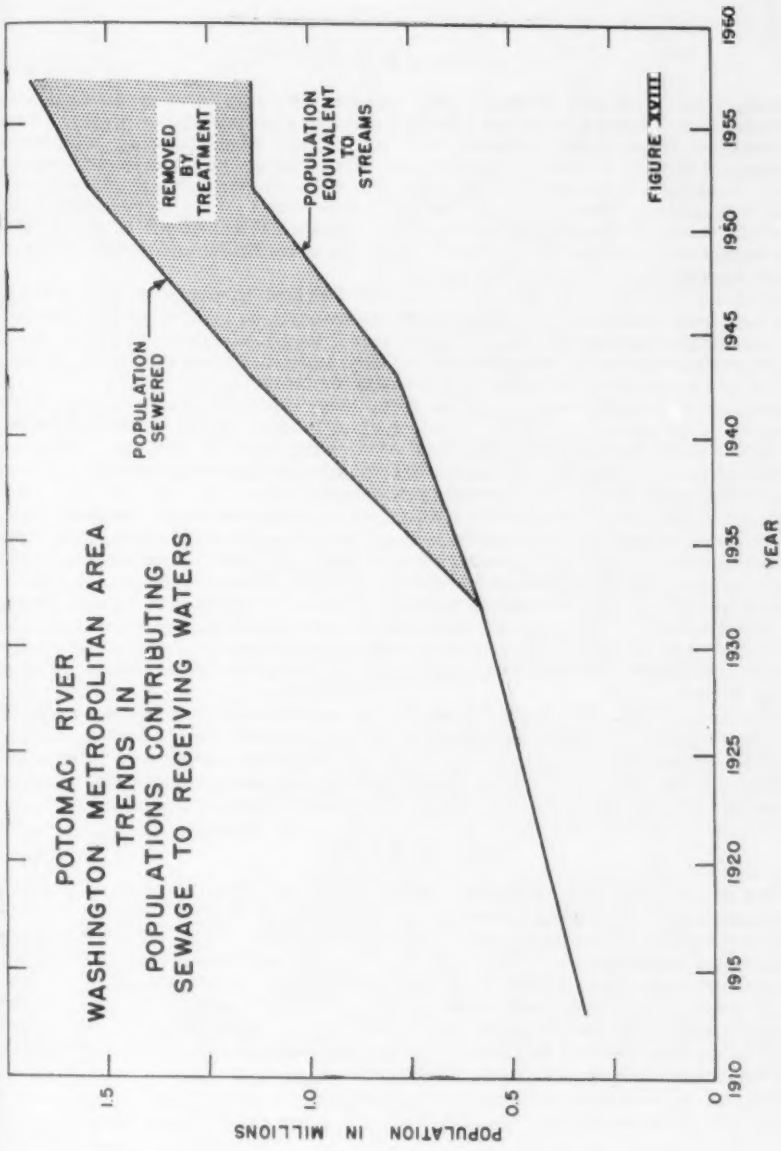
POTOMAC RIVER
WASHINGTON METROPOLITAN AREA
TRENDS IN
POPULATIONS CONTRIBUTING
SEWAGE TO RECEIVING WATERS
POPULATION SEWERED
REMOVED BY TREATMENT
POPULATION EQUIVALENT TO STREAMS
POPULATION IN MILLIONS
0
0.5
1.0
1.5
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
YEAR
FIGURE XVIII

EXHIBIT B

[Reprinted from Harvard Business Review, March–April 1958]

Is the United States running out of water?
How can we curb our wastes?
What should the businessman do?

THE FACTS ABOUT OUR WATER SUPPLY

By Gilbert F. White

Recent local shortages of water and regional droughts have given dramatic emphasis to predictions that the United States is running out of water. Notwithstanding these danger signals, and in the face of continually increasing industrial demands, it seems likely that the Nation as a whole has enough water to go around for a long time to come—if it will take prudent steps to make better use of what it has. The dire predictions of trouble ahead seem exaggerated unless the country, and in particular the business community, continues to ignore the clear opportunities to deal with the factors of price, tradition, and administration that at present impair water development.

This is not to deny that certain cities, such as those in northern New Jersey, have been hard pressed for drinking water as recently as last November, or that there are areas, like the Salt River Valley near Phoenix, where irrigation acreage is seriously hampered by lack of water. These and other shortages are real, but in most instances they are either unnecessary or temporary.

Although the trouble spots results from many special situations, they are generally symptomatic of conditions which stem in large measure from the view that water abounds, that it can be used at virtually no cost, and that it can be misused at no cost. Indeed, it sometimes appears that the chief difficulty is that we have had so much water at too low a price for too long.

An analysis of the present situation of water use of projected uses suggests that, while difficulties are bound to continue in some areas, the supply for the Nation as a whole is generous, and that attention should be turned to ways of reducing waste, curbing pollution, increasing efficiency of use, and stepping up the efforts to carry out the needed surveys and works. There is urgency in these actions. The combination of rapid population growth and heavy public investment in water-control works means that in 3 or 4 decades a major new pattern of water use and regulation will have been dug and dammed into the landscape of the United States.

Many businessmen have limited their interests in water to low-cost use at their own plants and to protests against Federal expenditure for Tennessee Valley Authority or western irrigation projects. It is time now to adopt a broader view. By taking a constructive position with regard to our water resources, business leaders can do much to protect the future of industry and the economy.

NEED VERSUS SUPPLY

If we consider only the amounts of water withdrawn from streams and wells, it is evident that irrigation farmers, manufacturers, and steam-electric power-plants are the major users of water in the United States today. Of the total estimated water withdrawn in 1955, 8 percent was for city supplies, 1 percent for farm and isolated rural supplies, 16 percent for industry, 45 percent for irrigation, and 30 percent for cooling of electricity-generating equipment (based on the gallonage figures in the last column of exhibit 1). According to this United States Geological Survey estimate, roughly one-fifth of the water withdrawn came from shallow or deep underground sources.

EXHIBIT I.—*Estimated major uses of water in the United States, 1955*

[In billions of gallons daily]

Use	Consumptive	Nonconsumptive	Total
Nonwithdrawal uses:			
Navigation channels	(1)	(2)	(3)
Water power	(1)	1,500.0	1,500.0
Waste dilution	(1)	(3)	(3)
Evaporation loss from reservoirs for all purposes [4]	23.0	None	23.0
Withdrawal uses:			
Public water supplies	2.0	15.0	17.0
Self-supplied uses:			
Rural	1.0	1.5	2.5
Industrial	1.2	37.5	38.7
Cooling generating equipment	0.7	71.5	72.2
Irrigation	66.0	44.0	110.0
Total (minimum) [5]	93.9	1,669.5	1,763.4

[1] Insignificant.
[2] Large.
[3] Unknown.
[4] Assumes a mean annual loss of 24 inches for reservoirs having a capacity of more than 5,000 acre-feet, and of 36 inches for smaller reservoirs.
[5] Total figures are minimum; the United States is using at least this much.

Sources: Estimated total withdrawal uses are from K. A. MacKichan, Estimated Use of Water in the United States, 1955 (U. S. Geological Survey Circular 398, 1957). Estimates of the proportion of consumptive use are by the author.

Difference in use

Such a tally of direct withdrawals, however, gives us an incomplete picture of the present uses of water. It is important to differentiate between consumptive uses, which physically remove the water molecules by evaporation or transpiration, and nonconsumptive uses, which return the water to the stream or ground without diminution in quantity. It is common to lump both consumptive and nonconsumptive uses together when estimating total withdrawal, even though cities rarely consume more than 10 percent of the water withdrawn.

We should also take account of the heavy losses of water by evaporation from reservoirs, which probably exceed the total city withdrawals. In addition, large but often unmeasured claims are made on flowing water for maintenance of navigation channels and of recreation pools, generation of hydroelectric power, and dilution of domestic and industrial waste.

Estimates of the various uses on this basis are provided in exhibit 1. Taking a conservative view, the total nonconsumptive uses in 1955 probably exceeded 1,670 billion gallons daily, and the consumptive uses probably exceeded 90 billion gallons daily. For comparison, the United States Geological Survey estimates that the mean daily streamflow in the United States is about 1,160 billion gallons daily. This should be a fairly close approximation of the total potential supply available.

If only the consumptive uses are considered, there would seem at first glance to be a safe margin between use and supply for the country as a whole.

Here, however, we come to a question about nonconsumptive use of water. So long as water is not actually dissipated, it may be used repeatedly, if its quality is unimpaired. For instance, water turning a series of power turbines loses some of its stored energy when it falls through a turbine, but it is still just as useful for all other purposes. But when the quality of the water is changed by heating, by organic or inorganic wastes, or by soil erosion and leaching, its value for other uses may be reduced or eliminated.

There is no doubt that some of the nonconsumptive uses of water do change its quality. But others do not change it appreciably, including hydroelectric power, which is a major item. This being so, the relation of use to supply seems comfortable.

Any such broad national comparison may be misleading, however, unless account is taken of trends in use, of the troubles which do exist in local areas, of the widespread waste, and of the growing commitments for nonwithdrawal uses in Federal programs.

PREDICTED TRENDS

We have had in the past 6 years a series of predictions of water-use trends which imply a doubling of total water use by 1975. It is partly on the basis of such forecasts that so much concern now exists as to the adequacy of present supplies. The two principal Government forecasts were made by the President's Materials Policy Commission in 1952 and by the Department of Commerce in 1956; they are summarized in exhibit II.

If the Department of Commerce forecast is realized in 1975 without corresponding changes in water uses, there may well be serious difficulty ahead. But my analysis of the situation suggests that this prediction is unduly large; and that even if it did prove to be correct, the restrictive effect on economic growth in most parts of the country would be relatively slight.

Public use

The predicted trends seem to be reasonable as far as domestic and rural supplies are concerned. Population estimates used are modest; and while there no doubt will be reductions in per capita use in some cities as a result of metering and pricing, the tendency is for daily use to increase in proportion to improvement in economic status.[1]

Industrial Use

On the other hand, estimates of increases in industrial use appear exaggerated. Most industries, including paper and pulp, petroleum, and steel, which together claim 70 percent of industrial use, have only begun to explore the technical possibilities of conservation, recycling, and reuse as means of cutting down use per unit of manufactured product. The same applies to the use of water for cooling in steam power generation. In a single industry such as steel or petroleum, the gallons used per unit of product may be 5 to 10 times the minimum, varying according to local needs and the design of the plant.[2]

At the present time much water, in effect, has a zero price.[3] The manufacturer may take it out of a well or nearby stream with no rent and at modest extracting cost. Moreover, water is a relatively small portion of the production cost in many industries, and the demand for minimum amounts at any given stage of technology is highly inelastic. So long as these conditions prevail, there is little incentive for manufacturers to go to the expense and trouble of installing equipment to cut down water use or to reuse waste water. Only as clean and abundant supplies become difficult or costly to obtain is there likely to be action to employ such equipment.

Assuming that only the current technology is applied, it seems reasonable to predict, as some competent sanitary engineers have done, that the national production index could be doubled without increasing total industrial use of water.[4] There is no doubt that this is technically possible. Total withdrawal can be greatly reduced. Moreover, on the average, only 4 percent of industrial water is used consumptively; much of the remainder can be treated readily for reuse.

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[1] See Morrison B. Cunningham. The Benefits of Effective Metering, Water and Sewage Works, June 1955, p. 235; and E. Sherman Chase, Metering and Rate Structures: A Review of Practices in the United States. Water and Sewage Works, August 1956, p. 356.

[2] Water Conservation in Industry: Task Group Report, Journal of American Water Works Association, December 1953, p. 1249.

[3] See Jerome W. Milliman, Commonality, the Price System, and Use of Water Supplies, Southern Economic Journal, April 1956, p. 425. Cecil Haver, of the University of Chicago, has made helpful suggestions on this and related questions.

[4] H. E. Hudson, Jr., and Janet Abu-Lughod, Water Requirements, Water for Industry (Washington, American Association for Advancement of Science, 1956), p. 16.

EXHIBIT II.—*Comparison of projections of water withdrawal in the United States, 1950–75*

Withdrawal uses	Policy Commission			Department of Commerce		
	Billions of gallons daily		1950–75 (percent increase)	Billions of gallons daily		1950–75 (percent increase)
	1950	1975		1950	1975	
Public water supplies	13.5	20.0	48	14.1	29.8	111
Self-supplied uses:						
Domestic and farm	3.5	5.0	43	4.6	7.2	50
Industrial and miscellaneous	45.0	90.0	100	46.0	115.4	150
Cooling generating equipment	35.0	125.0	256	38.4	131.0	241
Irrigation	88.0	110.0	25	100.0	169.7	70
Total	185.0	350.0	89	203.1	453.1	123

Sources: President's Materials Policy Commission, Report (Washington, Government Printing Office, 1952), vol. I, p. 51, and vol. V, p. 94; and United States Department of Commerce, Water Use in the United States, 1900–1975, Business Service Bulletin, No. 136 (Washington, Government Printing Office, 1956), pp. 1–4.

That substantial reductions in our industrial water use per unit produced may be expected in practice is suggested by several pieces of evidence.[5] The total industrial withdrawal for the United States apparently has not increased as rapidly since 1950 as had been predicted. Moreover, notable progress in reducing per unit consumption has been made in industries such as the paper and pulp group. It is significant that there are only rare instances in which large manufacturing plants have failed to locate in a particular area because of a prospective water shortage. More common has been the decision to go to considerable expense to store, supplement, treat, or reuse scarce supplies in order to benefit from other advantages of location.

Agricultural use

The prospect for an increase in water use for irrigation in arid and semiarid zones west of the 100th meridian is basically different. Such withdrawals, in which at least 60 percent of the water may be used consumptively, are likely to increase only as the Federal Government is willing to finance high-cost irrigation projects in preference to lower cost alternatives for stepping up agricultural production.

New irrigation projects are no longer needed in many parts of the West to stabilize adjacent dryland agricultural areas or to promote economic growth. Even when agricultural expansion is taken as an early need, other means such as fertilizers may be more attractive. The limit to further development is primarily a political one involving regional claims on Federal funds, Federal policy in applying hydro power revenues to multiple-purpose projects, and commitments for basinwide investment programs such as in the upper Colorado and Missouri Basins.

In the eastern, more humid regions of the United States, supplemental irrigation is spreading rapidly. Without any Federal subsidy, it is beginning to make heavy demands on ground and surface water. How far it may go is conjectural, but the Department of Commerce estimate for humid zone irrigation probably is low.

In sum, taking only the uses considered in the two Government estimates, the projected totals seem unduly high.

TROUBLE SPOTS

While the balance of supply and prospective use for the Nation as a whole may be favorable, I think we should recognize at least four types of serious trouble spots.

[5] See, for example, Francis Bello, How Are We Fixed for Water? Fortune, March 1954, p. 120.

Ground waters "mining"

One type is where ground waters are being "mined." In western Texas, for instance, the amounts pumped regularly exceed the natural replenishment. Current pumping rates in such areas may be profitable but will lead in varying periods of time to exhaustion. "Mining" has been curbed by regulation in certain areas, Long Island and North Dakota, for example, and it is being offset by artificial recharge at such places as Peoria and Los Angeles. But wherever it continues uncontrolled, the future promises ultimate depletion of water resources.

Heavy pollution

A second type of trouble spot occurs wherever heavy industrial or municipal waste loads so pollute the available waters as to render them difficult or dangerous to use. Along the main stem and some tributaries of the Ohio River, pollution hazards have been severe. The bordering States have sought through an interstate compact commission to set and enforce purity standards.

Poor planning

Much more widespread is the problem of supplies that are inadequate because of poor planning, dilatory preparation of plans, or administrative or legal delays in carrying out plans. Each year of an acute drought brings reports of cities running out of water. Commonly, this does not mean that there is insufficient water nearby to meet the cities' needs. Rather, it means that they have not taken the steps necessary to gain access to what is available.[6] Facilities to store water for use in dry seasons and dry years or to convey it from places of surplus to places of need may be called for.

Planning and constructing an efficient water storage and transportation project is a long and careful process at best; and when a faulty population forecast, shortage of materials, lack of financing, or an interstate water rights dispute holds up the proceedings, a shortage may occur if subnormal precipitation causes lowered water tables or stream flows.

A waterworks official recently said that a major cause of such delays was the tradition of cheap water rates, preventing both private and public suppliers from making needed improvements in their systems.[7] In effect, the consumers have been so happily convinced that water is a low-cost commodity that they resist many efforts to increase the reliability of supplies at modest expense.

Nonwithdrawal commitments

A further type of potential trouble is often ignored in making projections of water needs and supplies: the commitments made for maintenance of flow in a stream to advance navigation, to encourage recreation, or to dilute wastes. A Federal navigation project to get a 9-foot depth on the lower Missouri River, or a cottage colony on the shores of an Illinois reservoir, or the desire of a Virginia city to dispose of partially treated waste without impairing wildlife downstream, for example, may establish a demand for certain flows at crucial periods of low water.

This form of commitment is spreading as new multipurpose projects are constructed and as the number of interstate agreements covering water allocations rises. Estimates of the effect of these commitments need to be given heavier weight in future planning.

LANDSCAPE IN TRANSFORMATION

The net impact of the great river-basin programs which began to take shape in the 1920's and have been built on a broad scale in the past two decades is to transform the landscape of the United States into a new pattern of water distribution. Encouraged by the new construction techniques and by the savings from multipurpose design, reservoirs are changing the location of water in time, and canals and aqueducts are changing the location of water in place.

In a few rivers, such as the Tennessee and the Wisconsin, the task of regulation is largely completed. In most rivers the job is underway. When the new works are completed in the next three or four decades, they will have occupied most of the economical dam sites, stored much of the above-average flow, and

[6] Abel Wolman, Water Service and What It Costs Symposium: What Constitutes Reasonable Water Service? Water and Sewage Works, March 1955, p. 98.

[7] John H. Murdoch, Jr., 75 Years of Too Cheap Water, Journal of American Water Works Association, August 1956, p. 925.

impressed this new pattern on the fact of the continent as surely as railroad building between 1860 and 1900 froze a pattern of land transportation.

Is man's influence on physical processes in the landscape bettering or harming the situation? Is it aided by technological changes which are now in prospect?

Physical changes

A popular myth is that droughts as well as major floods are increasing in the United States because of the cutting of forests and plowing of grasslands. In general, this is not true; there are local situations where water and silt flows have been increased, but the net supply of water is not much changed. Two sets of forces tend to offset each other:

Forces working to reduce the total supply—

Some reservoirs are silting up.

Some ground water supplies are being polluted or exhausted.

New pollutants are being added to streams at about the same rate as old ones are treated.

Some grazing lands are being revegetated with consequent increases in water consumption.

Forces tending to increase the total supply—

Land treatment for erosion control is proceeding, although slowly.

Some underground reservoirs are now being recharged.

Weeds and other plants growing along banks of rivers and canals—heavy unproductive consumers of water—are being eradicated.

On balance, the physical supply, except in the areas of ground water mining, does not seem to be seriously depleted.

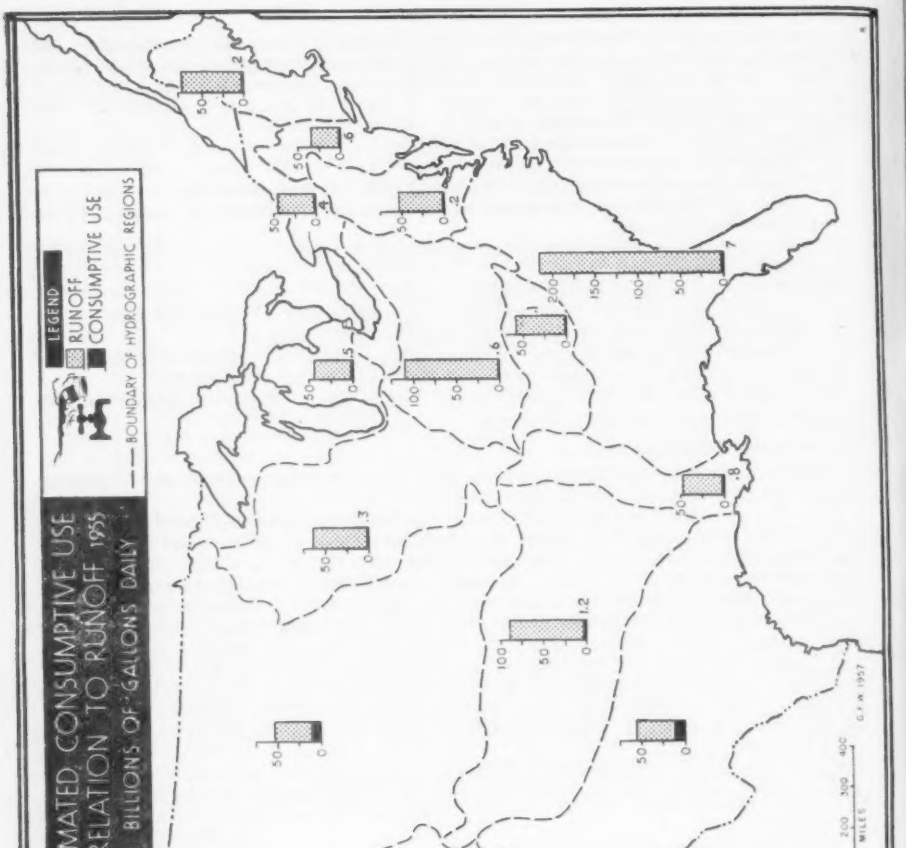
Technological changes

Several technological developments offer some encouragement for believing that available supplies may be increased:

(1) *The prospect for demineralizing sea water or saline inland waters at costs within the reach of domestic and industrial users.*—Both Government and private research offer hope of supplementing existing fresh water supplies from those sources, although conversion costs are still high, and in many situations pumping and transportation costs may, in fact, limit the conversion work.

(2) *Control of evaporation from water surfaces.*—By using cetyl alcohol or other monomolecular film it soon may be possible to reduce greatly the evaporation losses. This would be particularly important in zones where a reservoir may lose as much water by evaporation as it saves by storage. Whatever the precise economic limits of demineralization, evaporation control, and cloud seeding (if and when that becomes practicable), the net effect will be to increase total available supply.

There are many other changes in water-use techniques that may well either enlarge or diminish the demands for water. For example, improvements are


ESTIMATED CONSUMPTIVE USE IN RELATION TO RUNOFF 1955
IN BILLIONS OF GALLONS DAILY
LEGEND
RUNOFF
CONSUMPTIVE USE
BOUNDARY OF HYDROGRAPHIC REGIONS
MILES
G.F.M. 1957

being made in ways of reclaiming sewage, treating industrial waste, and growing vegetation with saline water. On the other hand, the combination of new spray equipment and a method of budgeting water needs is placing heavier demands on water for irrigation in the humid East.

Technology may also add to supply by reducing needs for water. The Chesapeake and Ohio Canal was built to foster transportation up the Potomac, but it now serves chiefly as a recreation area for Washington, D. C. The Chicago Sanitary Canal was built to help dispose of sewage, but is coming into new service for navigation. Perhaps similar changes may be in store for water projects which are under construction today.

Regional differences

With these general relationships in mind we may review the differences from one part of the country to another in supply and use. Taking the United States Geological Survey data on waterflow and water withdrawals, a rough estimate has been made of the ratio of consumptive use to total supply in 1955; this is shown in exhibit III.

In two regions, the Great Basin and the Colorado Basin, the ratio is less than 1 to 1.5. That is, roughly two-thirds of the average flow is used consumptively. In three—the Missouri-Hudson Bay, Western Gulf, and South Pacific—it ranges between 4.7 and 6.6. Among the areas east of the Mississippi River, the Delaware-Hudson region has the smallest proportion of consumptive use with a ratio of 1 to 53. Each river basin has its own unique combination of supplies and uses.

Obviously, there are parts of these regions where the margin between supply and consumptive use is getting dangerously small. But even there, when the large current waste and the small consumptive use for domestic and industrial uses are taken into account, it would seem that only irrigation development need be seriously hampered by water supply for a long time to come. To this sanguine view I attach one important qualification: I am assuming that effective measures will be taken to guard and make use of the remaining supplies.

MANAGEMENT OF RESOURCES

Because the opportunities to reduce water use rest largely in the hands of individual managers, and because much of the growing inflexibility in water availability and withdrawal hinges on local and interstate commitments, it would be misleading to think that a continuous volume of Federal expenditures for river-basin projects will assure the necessary remedial action. We do not have integrated management of water resources by either Federal or Statte agencies. Administrative responsibilities are divided widely, and certain legal rights, such as ground water rights, are undefined in many States.

The idea of making wise use of every drop of water in a basin to serve multiple purposes in the development of a region is accepted in principle. In practice, however, we have not yet found any effective way to relate the efforts of farmers, corporations, cities, States, and Federal bureaus in unified planning and operation. Earnest experiments are underway to shape cooperative studies and agreements, as in the Potomac and the Colorado areas, and there have been repeated attempts to suggest unified national policy and organization,[8] but we need more vigorous efforts.

Action by businessmen

In the meantime, businessmen can take considerable responsibility in insuring our water supply in at least four ways:

(1) *Perhaps most importantly, they can make themselves aware of the current situation and look ahead to the time when the price on water will require much more efficient use than would have been anticipated 10 years ago.*—The sooner they face up to the need to conserve, recycle, and reuse water and to reduce the amount of polluting waste, the less painful the readjustments will be later on. Plans for new plants and replacement programs now should take this into account.

(2) *They can also stimulate and support studies which get at the facts on water supply and needs in entire basins or groups of basins.*—New surveys currently are being made in northern Ohio. In the Delaware Basin a citizens'

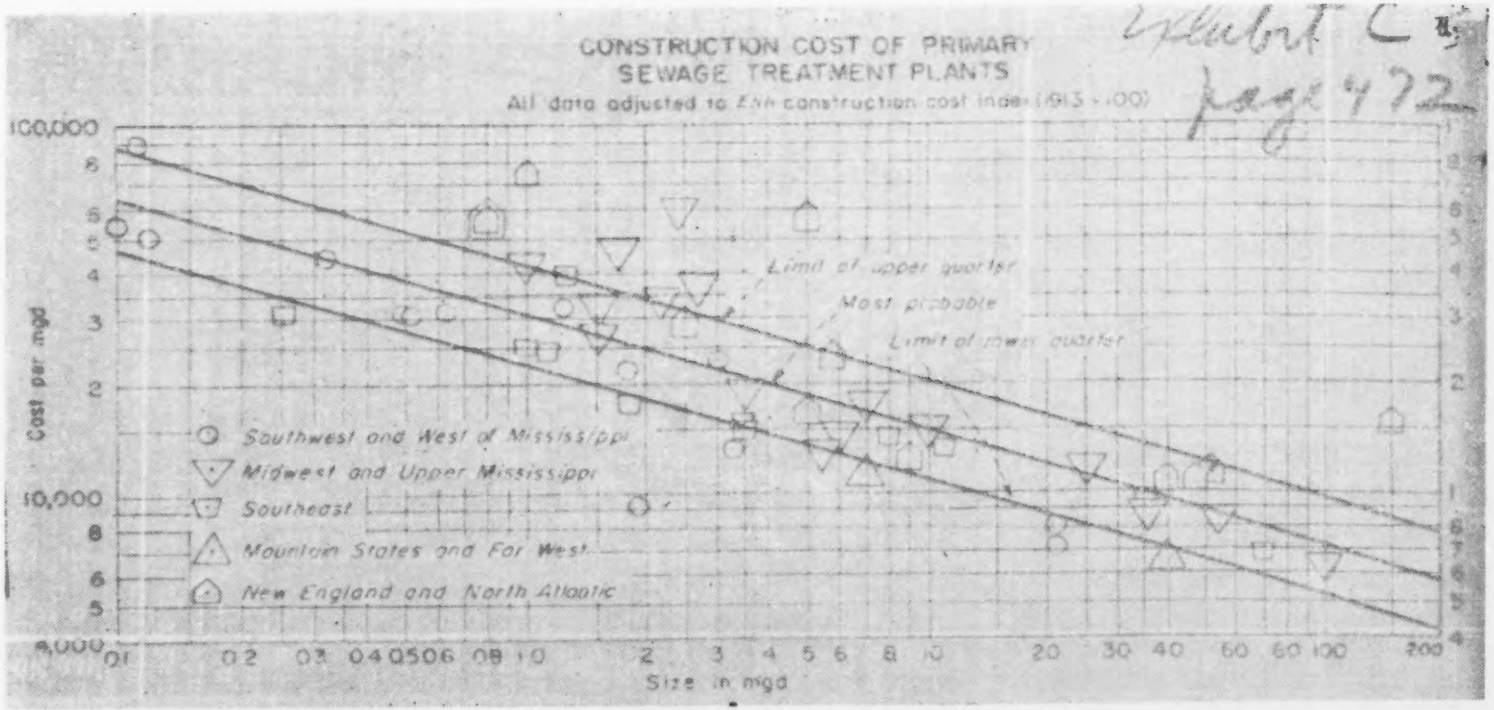
[8] See, for example, Report of the Natural Resources Task Force, United States Commission on the Organization of the Executive Branch, 1949, and Report of the President's War Resources Policy Commission, 1950.

commission representative of the four States and New York City and Philadelphia is exploring ways in which both local and State groups can supplement the river-basin studies of the Corps of Engineers.

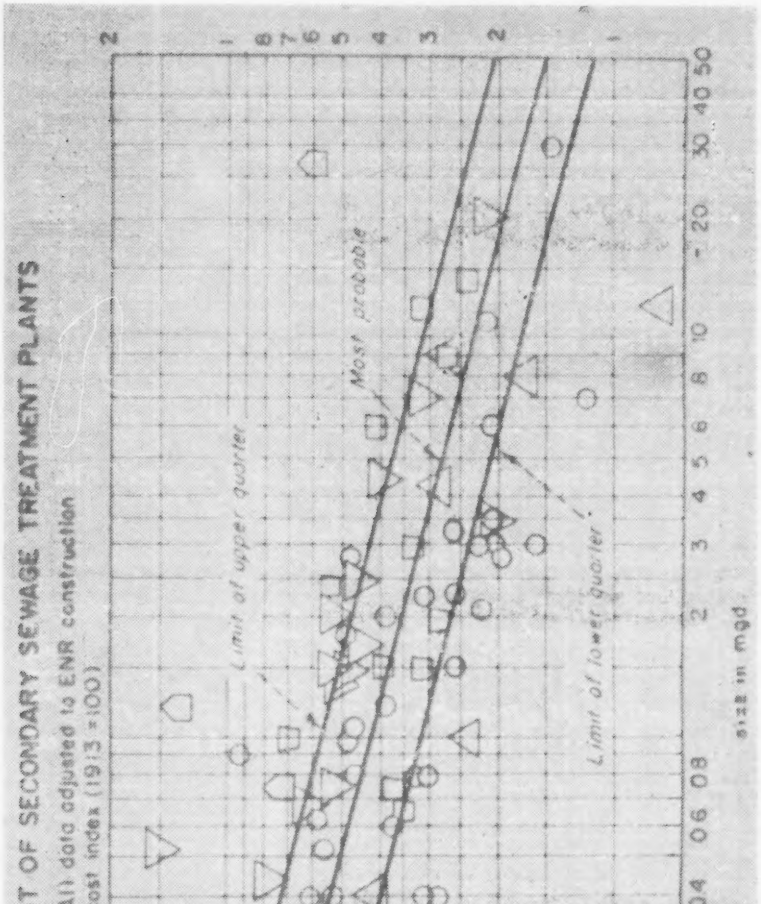
(3) *They can press for adequate State or interstate standards and regulations affecting water purity and water allocations.*—Some such action already is underway. The Ohio River Valley Water Sanitation Commission forces the installation of industrial waste treatment, and in so doing it also helps assure a more suitable supply of water for industrial expansion. In Illinois, the State chamber of commerce has taken the lead in sponsoring a study of the need for revision of water laws. There has been a wave of almost hysterical interest in water rights legislation in the Eastern States, generated in large measure by the spread of supplemental irrigation, but there are no easy legal panaceas.

(4) *They can push for a national review agency of the type recommended by the first Hoover Commission.*—Such an agency, whatever its precise form and whatever reorganization may be achieved in the Federal agencies, could give the country a relatively impartial and realistic review of the probable effects of the many river-basin projects that will be claiming funds and water in the years ahead. It would, however, be relatively ineffective if it were merely to comment on what is proposed by Federal agencies. It is not enough to approve or disapprove a single project. A sound basis should be provided for selecting among the many possible combinations of resource allocations.

While there still is time to exercise some choice, the full range of opportunities to store, regulate, and allocate the waters of the country to promote human welfare should be examined critically. Each new commitment to new projects in the face of growing demands on a fixed but still relatively plentiful supply does not limit the range of choice ahead.


CONSTRUCTION COST OF PRIMARY SEWAGE TREATMENT PLANTS
All data adjusted to ENR construction cost index (1913 = 100)
Exhibit C
page 472
Cost per mgd
100,000
10,000
8,000
Limit of upper quarter
Most probable
Limit of lower quarter
Southwest and West of Mississippi
Midwest and Upper Mississippi
Southeast
Mountain States and Far West
New England and North Atlantic
0.1 0.2 0.3 0.4 0.5 0.6 0.8 1.0 2 3 4 5 6 8 10 20 30 40 60 80 100 200
Size in mgd

Primary plant estimating curves are good for plants of approximately 35 percent BOD removal


CONSTRUCTION COST OF SECONDARY SEWAGE TREATMENT PLANTS
All data adjusted to ENR construction cost index (1913 =100)
Limit of upper quarter
Most probable
Limit of lower quarter
COST PER MGD
SIZE in mgd
200,000
100,000
10,000
001 .006 .008 .01 .02 .03 .04 .06 .08
1 2 3 4 5 6 7 8 10 20 30 40 50

Secondary curves are for trickling filter and activated sludge plants. See primary graph for legend of data points

NEW GUIDE TO SEWAGE PLANT COSTS

In an effort to update the widely used cost yardstick prepared by Prof. C. J. Velz for Engineering News-Record 9 years ago, ENR gathered current data and asked the author to analyze them. Mr. Diachishin found that sewage plant costs have decreased 30 percent since 1948 (on a base year dollar basis) and that the changing picture deemed it advisable to present Velz-type estimating curves in a different, and incidentally simpler, manner.

Alex N. Diachishin, consulting engineer, Bergenfield, N. J.

Sewage treatment plant costs have decreased approximately 30 percent since 1948—using figures adjusted to a base year with the ENR Construction Cost Index. This is the most striking conclusion from recent construction cost data gathered by ENR, from which the author has prepared estimating curves for primary and secondary facilities.

Cost information for treatment plants constructed since 1947 came from consulting engineers all over the country. Costs are for treatment plants only, including sludge handling facilities but excluding interceptors, outfalls, land acquisition, site development, engineering, legal, interest, and pump stations.

Number and locations of plant data used in the analysis are shown in the table. No intermediate (chemical coagulation) plants were included because the number reported in the survey was deemed statistically insufficient.

Data analyzed by Prof. C. J. Velz (now at the University of Michigan) for his widely used yardstick (ENR October 14, 1948, p. 84) included all types of plants adjusted to a single estimating curve. The Velz curve is based on 100-percent BOD removal. To obtain estimated costs for activated sludge, trickling filter, chemical coagulation and primary plants, base curve values are multiplied by 0.90, 0.85, 0.65, and 0.35, respectively. Thus an activated sludge plant would cost 0.90/0.35, or 2.56 times as much as a primary plant of the same capacity.

WHY TWO GRAPHS

Evaluated statistically, the secondary-to-primary plant cost ratio for the 1957 survey data varied from 1.16 for 0.01 mgd plants to 1.57 for 100 mgd plants. Because of these changing ratios, separate curves were calculated for primary and secondary plants.

Initially, however, the 1957 survey data were fitted to a single base curve utilizing the Velz 100 percent method. Surprisingly, slope of this curve, on log paper, was almost identical to the Velz line (see small graph). But the new curve was displaced downward from the original, such that the average cost was only 70 percent of the Velz costs. Correlation of the 1957 curve by the least squares method demonstrated a very good fit.

Since the methods used by Professor Velz and the author to determine plant costs were identical, and since both cost studies represent a substantial portion of the total number of sewage treatment plants constructed, the indicated decrease in treatment plant cost must be accepted as real.

Probably one of the important reasons is increased efficiency of design. Sewage plant design, only recently in an embryonic stage, has developed such that a host of able practitioners with the help of standards and guides offered by control agencies, are turning out a better job. Secondly, there is better equipment available for many of the unit processes in a sewage treatment works. Lastly, research has developed new methods which have tended to reduce the cost of sewage treatment.

1957 CURVES

In the accompanying two larger graphs, lines of best fit are shown for primary and secondary plants. This average, or most probable, curve represents typical practice in the United States for post World War II years. In addition, each graph contains "quarter" curves which enclose approximately 50 percent of all the data points.

To illustrate use of the curves, suppose that an estimate for a 1.0 mgd primary treatment plant is required at a time when the ENR Construction Cost Index (1913=100) is 700. Then in 1913 dollars, the average cost per mgd of capacity is read as \$31,100. Total current estimated cost is then $1.0 \times \$31{,}000 \times 7.00 = \$217{,}700$. Similarly, half of the plants this size should range in cost between \$158,900 ($1.0 \times \$22{,}700 \times 7.00$) and \$298,900 ($1.0 \times \$42{,}700 \times 7.00$).

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REGIONAL DIFFERENCES

Analysis of regional differences in total plant costs reveals the interesting data in the last column of the table which covers both primary and secondary plants. Reliability of the two 15 percent deviations from average is only fair to poor because of the paucity of cost data for these two regions.

There can be no doubt though that regional differences exist in the plant cost data collected for this 1957 survey. One reason, valid to some extent, is that the survey plants are not truly typical of the region since they represent a comparatively small sampling of the total number of plants that are found in the area.

Designed differences—those due to regulatory agency requirements, site pecularities or personal preference of the designer—could account for some of regional variations in plant costs. Regulatory requirements are indeed different in many States, but in recent years there has been considerable standardization (notably the "Ten State Standards" embracing Midwestern and North Atlantic States) that have tended to minimize regional differences. Similarly it would appear that site difficulties would crop up as much in one region as in another. And although personal preferences of designers do occur, it appears unlikely they would occur on a regional basis.

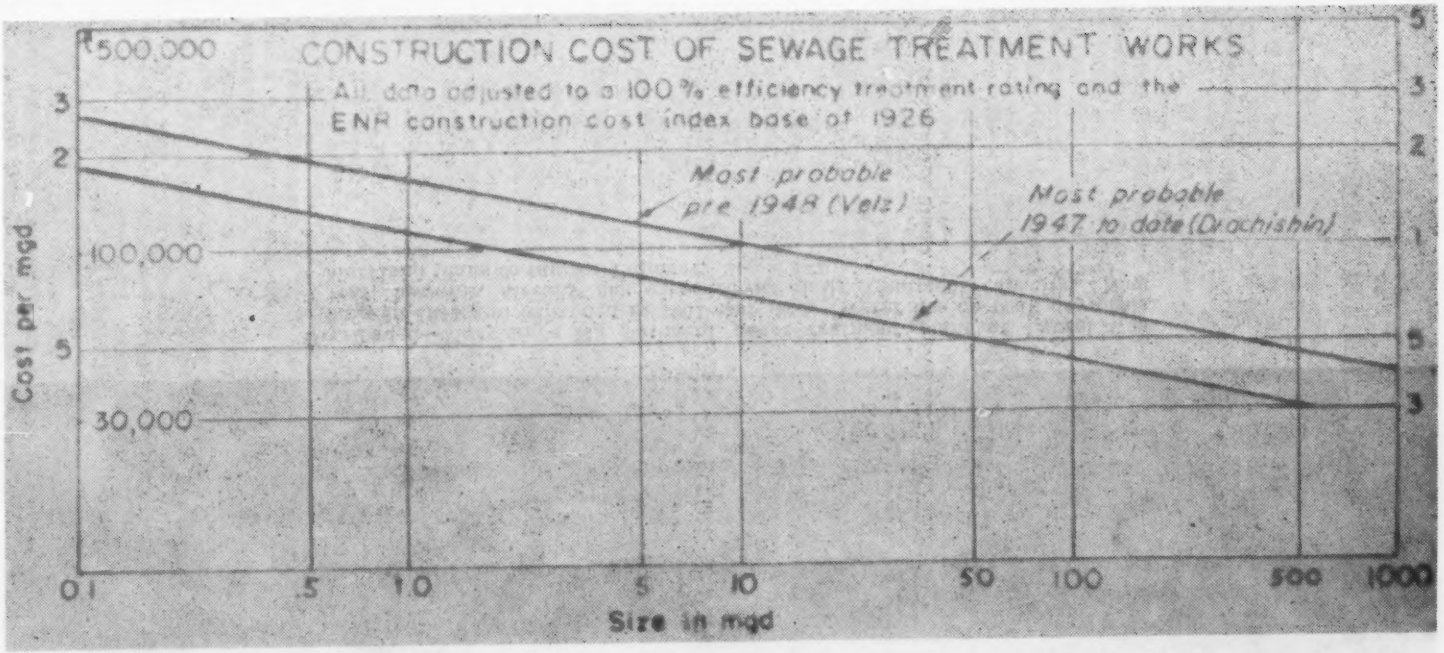
Thus, the conclusion is reached that construction differences—regional patterns in labor, material and number and type of contractors—account for most of the regional variation in costs.

According to the consultants who—

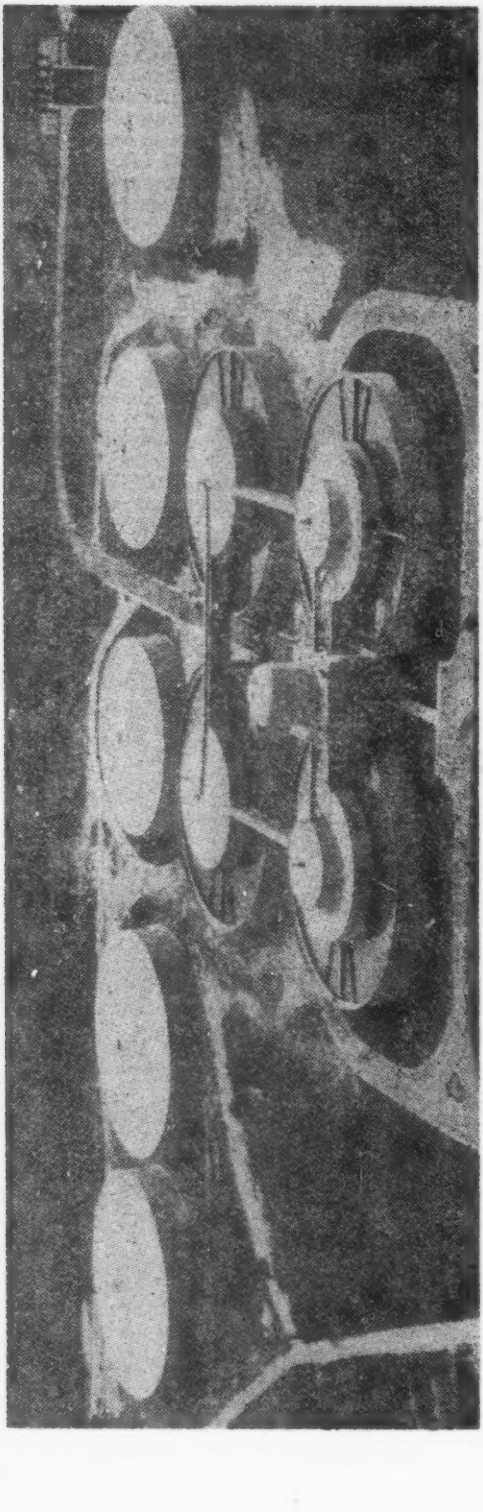
Summary of survey data

Region[1]	Number primary plants	Number secondary plants	Total	Percent deviation of cost from average
New England and North Atlantic	12	6	18	+15
Southeast	11	16	27	0
Midwest and Upper Mississippi	16	16	32	+5
Southwest and East of Mississippi	14	50	64	−10
Rocky Mountains and Far West	2	11	13	−15
Total	55	99	154	

[1] New England and North Atlantic: Connecticut, New Jersey, New York, Delaware, Pennsylvania, Rhode Island; Southeast: Virginia, North Carolina, Florida, South Carolina, Georgia, Alabama; Midwest and Upper Mississippi: Kentucky, Tennessee, Minnesota, Michigan, Ohio, Indiana, Wisconsin, Illinois; Southwest and West of Mississippi: Oklahoma, Kansas, Missouri, Texas, Arkansas, North Dakota; Rocky Mountains and Far West: California, Wyoming, Oregon, Washington, Colorado, Idaho, Montana.



Comparison of 1957 survey data with 1948 data proves 30 percent decrease in plant cost.



Overloaded—Maryland's big Patuxent water-treatment plant at Laurel was built in 1944 and expanded in 1951 and 1955. Water use on peak days this year, however, already has exceeded its daily treatment capacity. Now Maryland plans to tap the Potomac.

EXHIBIT D

[The Sunday Star, Washington, D. C., October 27, 1957]

POTOMAC IS KEY TO FUTURE WATER SUPPLY

A family in Washington's metropolitan area may pay any 1 of 25 different rates for its household water.

If you live in Alexandria and use 7,000 gallons of water a month, you get an annual bill of $38.36. In the District, you pay only $16.40. If you live just outside Falls Church, you are charged $49.64; your neighbors just inside the city limits pay only $41.60. In Montgomery County, you pay $24.68; in Rockville, $29.40. If you live in Fairfax County you pay any 1 of 19 different bills which range from $24 to $64.80.

These cost differences are cited not merely to emphasize that water bills vary greatly among the many communities which make up the metropolitan area—referred to as the "metro" in this series. The true significance of the differences is that they illustrate the chaotic, piecemeal pattern of Washington area water development at a time when the area's growth prospects are making the various communities increasingly dependent on one another.

Some parts of the area, it is true, already rely heavily on their neighbors for water. Some have large expansion programs, designed adequately to meet their individual future needs. But lack of foresight has left others with shaky water supplies and prospects of huge indebtedness in the near future. In some cases, the struggle for water has brought conflicts which have jurisdictions at each other's throats.

This patchwork character of water supply and distribution would be less important if the Washington metro were full grown. Then each jurisdiction could continue indefinitely to struggle with its own problems in its own way. But the Washington metro is in the midst of tremendous expansion and urbanization, and every day it becomes more apparent that the old individual problems are becoming common regional problems. The problems raise questions which fall into three rough groups. They are:

1. Will there be enough water to go around, and will present safeguards be adequate to protect regional sources of drinking water from pollution in the future?

2. How will expensive new water systems be provided? Can new pumping stations and filtering plants be built more economically by spreading the costs the residents of several jurisdictions? Could such regional programs cut rates, improve service and result in the best possible quality of water?

3. How will water programs determine the future shape of the regional community? Will they permit part of the area to shoot ahead while others lag behind? Or will they encourage an orderly, planned growth throughout the region?

These questions are important elements in Washington's total problem of urban growth. Let's see how they affect the different jurisdictions of the metro area and the people who live in them.

THE SUPPLY

It seems ridiculous even to suggest that the Washington area—no matter how big it gets—ever could run out of water. And officials emphasize that such a crisis need never occur. Yet a growing number are convinced that it will occur—perhaps within the next two decades—unless steps are, taken to prevent it.

The main reason for their concern is that metro Washington has reached a stage in its development where almost all future growth will depend upon a single water source—the Potomac.

Therefore, they say, steps must be taken to store water in the Potomac River by use of dams, so that future needs can be met, especially during summers when the river runs low and demand runs high.

Up to now, the Washington metro has been able to rely exclusively on a great variety of water sources. Here is a thumbnail sketch of those sources:

District of Columbia.—Potomac River. Huge conduits carry raw water from Great Falls to the Dalecarlia treatment plant on MacArthur boulevard near the District line. A huge new pumping station is under construction with District funds on the Potomac at Little Falls, about a mile upriver from Dalecarlia.

Arlington County.—Potomac River. Purified water from Dalecarlia is carried across the Potomac in Arlington-owned conduits suspended from Chain Bridge, Arlington pays the District 10 cents for each 1,000 gallons of water.

Falls Church.—Potomac River. Falls Church taps the Arlington conduits at Chain Bridge, and uses its own pipeline system from that point. It pays Arlington 10½ cents per 1,000 gallons.

Montgomery-Prince Georges Counties.—Patuxent River. Nearly all residents are served by the bicounty Washington Suburban Sanitary Commission, which draws water from two 6½-billion-gallon Patuxent reservoirs at Brighton Dam, near Ashton, and Rocky Gorge Dam, near Laurel. Exceptons are about 50,000 residents served by privately owned wells, and the town of Rockville. Rockville has its own system, currently served by wells, supplemented by water bought from WSSC.

Aexandria.—Occoquan Creek, about 12 miles south of Alexandria. Water is provided entirely by a private profitmaking firm, the Alexandria Water Co.

Fairfax County.—No dominant source. Many residents have private wells. Many are served directly by Falls Church and by the Alexandria Water Co. Three towns—Herndon, Fairfax and Vienna—have their own systems, fed by wells and supplemented by Falls Church water. Other scattered communities are served by 13 privately owned water companies. These companies rely on wells, or the Alexandria Water Co., or both.

But most of the old sources, like the Patuxent and the Occoquan, have production limits that already are in sight. Community wells, adequate to serve rural areas of the past, are drying up under urban development. Both Maryland and Virginia communities, able to ignore the Potomac in the past, have plans to tap it in the near future.

The Army engineers, responsible for assuring an adequate Potomac supply, are at work on a long-range study to determine the ultimate water demand, maintenance of a year-round dependable supply, and the type and location of dam facilities needed to meet the needs.

The biggest question mark is the amount of water that will be siphoned from the river to irrigate Maryland and Virginia orchards and farms along the upper stretches of the Potomac. For every gallon that is taken out will be 1 less gallon available for Washington area consumers. How serious is this threat?

Engineer officials say that if all the farmland along the Potomac were irrigated to its full potential, there would not be a drop of water left in the river during dry spells at Great Falls—the point at which the Potomac is tapped for Washington area water. No one knows whether irrigation will hit this peak. But even the possibility is a graphic measure of the threat.

Even apart from the irrigation threat, however, officials predict that metro water consumption alone will be so huge it will sure of the adequacy of the common water source. And conversely, the most efficient storage dam program cannot be planned unless it is geared closely to the future demands of each jurisdiction.

All jurisdictions which use the Potomac may well have to contribute to the costs of whatever dams are needed. So they have a direct financial stake in the decisions.

Unified support will be needed to sell any dam program. The Army engineers' proposal of a huge dam at River Bend, for example, has stirred bitter controversy. Whether this, or some other plan, is the right answer is something all jurisdictions should help determine.

The possibilities of recreational development in connection with dams—possibilities barely thought of as yet in metro Washington—also are of concern to the whole region.

The firmest kind of cooperative action will be necessary to protect metro drinking water from pollution. Great pressures already are building up, for example, for intensive development along the Potomac shores. To what extent should Maryland and Virginia restrict such development? What are the common standards they should follow to enforce zoning? These are questions that can be answered only if the various jurisdictions are willing to talk together about them. Thus far, they have been too involved with their own problems to do it.

VIRGINIA'S PROBLEMS

The water programs of Virginia's four big jurisdictions—Arlington, Alexandria, Fairfax, and Falls Church—present a sharp contrast of efficiency and chaos. They demonstrate both the benefits of advance planning and the nightmarish problems of too little action too late.

Arlington County, with an area of 24 square miles, is the stable member of the metro community. With only 16 percent of its land area still vacant, it has

passed its peak of urbanization. Its distribution system is scheduled for expansion, as exceed dependable river supplies. One interim study, in fact, estimates that if the Potomac were to reach the record low flow registered in 1930, it would fall short by more than 100 million gallons of meeting the peak-day consumption demand that might be expected in 1980. And this estimate includes the maximum supplies of water from the Patuxent and Occoquan.

Predictions such as these are hotly disputed by some other students of the problem. But when there is any expert doubt about its future water supply, no community can ignore the situation.

If the Army engineers are at work on the supply problem, why should area jurisdictions concern themselves with it? This is a question some officials today are asking.

That, however, does not eliminate the fact that area jurisdictions are being drawn for regional water system for the future.

There are several answers to it:

Jurisdictions cannot make realistic plans for water system expansion unless they are needed, to bring water from the District's Dalecarlia plant to future county residents.

Alexandria is at the crossroads. Served by the privately owned Alexandria Water Co., the city is considering its acquisition as a municipal operation. Such a move would require the city to take over the entire system, including Occoquan facilities and watermains through Fairfax County. The issue is being forced by the private company's bid for a substantial rate increase.

Sprawling Fairfax County, with 90 percent of northern Virginia's land area and only 40 percent of its population, is in desperate straits. The only jurisdiction in metro Washington which does not have an organized water system, Fairfax has lagged in orderly growth. Clusters of development are served by their own small systems, mostly privately owned, depending on wells and to an increasing degree on water bought at premium prices from their neighbors. Low pressure at times reduces household flow to a trickle. Some areas lack adequate fire protection. Others are threatened by pollution. Fort Belvoir, for example, is looking for a new water supply because Fairfax sewage effluent is polluting Accotink Creek—the only source it has now.

Last month, Fairfax took the big step. It created a water authority, which is intended to develop a countywide water system. The intention is that it will begin to buy up the private water companies, with loans financed through revenue bonds. It is hoped that within a few years the county can go to the Potomac for a water supply of its own.

The problems the Fairfax authority faces are tremendous. Biggest is money—the prices it will have to pay to buy up the private companies. Many Fairfax residents feel they paid at the time they bought their houses for facilities the authority will have to buy all over again. This feeling is based on the fact that developers of subdivisions frequently built new water lines—in order to sell their houses—and turned the lines over to the private companies to operate. Costs of building the lines, presumably, were passed along in the price of the houses.

As if these problems were not enough, Fairfax officials say, they also have to contend with Falls Church.

Falls Church is the little giant among metropolitan Washington water operators.

Several years ago it contracted to buy purified Washington water from Arlington County. It put in its own water mains for the 7 miles through Fairfax County from Chain Bridge to Falls Church—and from there it started to grow.

Today, the water system of the 1-square-mile city covers over 40 square miles of Fairfax County. It serves its own population of about 10,000 people, and about 30,000 residents of the county. Its lines run to Vienna and McLean, to Merrifield, and even to the town of Fairfax. Last year, Falls Church took in a tidy $500,000 in water revenues, which officials said provided "a nice surplus" for other needs. For the future, the Virginia city has paid the District $205,000 for a pipeline in the new Potomac water-intake dam at Little Falls. In a few years, it intends to pull away from Arlington County and live on its own water supply from the District's Dalecarlia plant.

Fairfax County officials are furious—and helpless. They contend there is something immoral in the way Falls Church has "encroached" on the most productive urban portion of "our county." Falls Church officials say they are merely providing water service which Fairfax County has been unable to provide. In most instances, they say, they have been asked by county residents to extend lines to them. They know that new development will be stimulated along the

water mains they have put in, and they frankly say they are "capitalizing on our own foresight" to obtain increased water revenues.

One member of the Fairfax Board of Supervisors said his greatest fear was that Falls Church's water extensions might be the first step toward annexation of some of the county's prime tax-producing land. The fear is one reason that some officials believe Fairfax County should incorporate as a city to protect itself from annexation.

Meanwhile, the little town of Fairfax is waging a court battle to extend its water lines 22 miles through Fairfax County into Loudoun County to tap Goose Creek as a water supply. Loudoun officials are fighting the move. Fairfax County officials also are opposed, saying such a move would duplicate "the Falls Church problem" all over again, and also stimulate intensive development in a part of the county where they want to hold development down.

THE MARYLAND PICTURE

Suburban Maryland's water picture is as different from the chaos in Virginia as night is from day.

Montgomery and Prince Georges Counties have expanded steadily outward from the District line. Some planners feel the growth has been too intensive; that in spots it has caused serious overcrowding and congestion which could have been avoided by better planning. There is little question, however, but that the pattern of growth has been greatly influenced by the water and sewerline extensions of the powerful, ambitious Washington Suburban Sanitary Commission.

The commission is metro Washington's prime example of an efficient regional authority, operating without regard to the political boundaries of Montgomery and Prince Georges Counties. In operation since 1918, the WSSC sends water to 500,000 residents of the 2 counties, and charges the same domestic rates to them all.

By the year 2000, WSSC officials expect to be serving 1.2 million people. To do it, they have announced plans to start construction next year of a giant plant that will tap the Potomac near Watts Branch. Eventually, the $28 million plant is expected to provide 120 million gallons of water a day—double the amount it now gets from the Patuxent. The Watts Branch site, however, is highly controversial. Some Maryland planners, as well as civic groups, are vigorously fighting the location, and propose that an alternate site near Great Falls be selected.

While Maryland has no counterpart of the bitter Fairfax-Falls Church conflict, it is not without duplication in water programs. For about 2 miles downriver from the proposed WSSC plant on the Potomac at Watts Branch, the town of Rockville 2 months ago began construction of its own pumping station and filtration plant. The $2.6 million plant, to be finished next year, will have a capacity of 4 million gallons a day, with expansion possibilities to double that.

WSSC officials frankly say they would like to have absorbed Rockville in their own system. Rockville decided to go it alone because it frankly wants no part of the big commission, and because it was unable to negotiate a satisfactory deal to buy water wholesale from WSSC.

If both the Rockville and WSSC Potomac plants are completed, as planned, nevertheless, they will present the incongruous picture of parallel water systems, serving the same general area.

THE PROSPECTS

It would be blind optimism of the highest order even to suggest that Washington's metro jurisdictions will resolve all their conflicts, and happily work together, drawn closer together by their mutual reliance on the Potomac River for future expansion. And it does not reduce the possibility that this common source may suggest new opportunities and incentives for joint agreements to meet future water demands.

The most challenging possibilities lie in opportunties for new political arrangements between jurisdictions, in which they would pool their resources in common water facilities to save money and increase efficiency.

The most drastic possibility is a true regional authority, which might cover the several jurisdictions just as the Washington Suburban Sanitary Commission covers Montgomery and Price Georges Counties. Such an authority would collect water, purify it, distribute it, and bill all the users at a common rate.

Is such a drastic step feasible? Most area officials doubt it, because needs vary so greatly among jurisdictions. It is difficult to set up a unified system among jurisdictions, they say, unless the needs of the jurisdictions are comparable.

They see much more hope in regional pumping stations and purifying plants on the Potomac, from which various jurisdictions could draw their own water, distribute it through their own water mains and then collect their own water bills.

When Fairfax County goes to the Potomac for water it must decide whether to build its own plants, or buy purified water from someone else. Some county officials lean toward the idea of a separate county plant. Yet Washington's Dalecarlia plant, officials say, can meet all of Virginia's future water needs to the year 1975, on the basis of Dalecarlia expansion programs already projected.

With both Virginia and Maryland turning to the Potomac, would there be savings if both pooled their resources in a common plant? Could Maryland, as well as Virginia, save money by drawing on the Dalecarlia plant for some of its expansion needs?

Questions like these will grow in importance as the cost of providing water—and the demand for it—continues to increase. Metro Washington will never get the answers to them, unless it asks.

Representative HYDE. Thank you, Mr. Auld. This meeting is now adjourned.

(Whereupon, at 12:05 p. m., April 25, 1958, the committee adjourned.)

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